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The Role of Artificial Intelligence in Multi-Actor Decision-Making: *a focus on human capital investments*

PhD programme in Social Psychology, Developmental Psychology and Educational Research
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Department of Social and Developmental Psychology
Sapienza University of Rome

PhD Candidate: Silvia Marocco

Supervisor
Professor Alessandra Talamo

Co-Supervisor
Professor Andrea Gaggioli

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Introduction

This research project aims at contributing to the development of a human-centered methodology for the design of Multi-Actor Decision Support Systems (MADSS) based on Artificial Intelligence (AI), moving beyond a purely technical viewpoint, and incorporating social and contextual dimensions of technological integration.

In particular, the research focus is directed to provide a theoretical framework and practical guidelines for enhancing the user-centered design of a MADSS in the complex field of *Investments in Human Capital* (IHC), specifically within the context of organizational development. Organizational development, indeed, can be considered as an example of IHC, since it deals with investments in intangible assets, such as an individual's knowledge, skills, and abilities (Schultz, 1961).

To investigate this field and apply the research methodology, access to a real case study was provided by Mylia - a brand of The Adecco Group specialized in training and development - for the design of "*AHEDA*", an AI-based MADSS conceptualized to identify targeted development and training pathways for employees.

This thesis is structured into two distinct sections:

- *Part 1,* which comprises Chapters 1 and 2, is dedicated to literature review.

- *Part 2*, encompassing from Chapter 3 to Chapter 9, focuses on presenting the real case study, the methodology employed, and the obtained results and design implications.

More specifically, Chapter 1 entails an initial literature review, exploring and identifying psychological theories that might effectively model Multi-Actor Decision-Making (MADM) processes and offer tools for comprehensive description in the field of IHC.

Moving to Chapter 2, we delve into the role of technology, specifically AI, in organizational and managerial DM. An overview of the current state of art of AI in DM is provided, accompanied by an analysis of the challenges and opportunities it entails. Additionally, given the existing literature gap, a systematic literature review has been conducted to investigate managers' facilitators and barriers that significantly influence the adoption of AI within organizational DM.

In the opening section of *Part 2*, research questions are presented. Subsequently Chapter 3 provides an overview of AHEDA case study as an example of IHC, highlighting its contextual aspects, the categories of actors involved in the MADM, and the valuable contributions of multidisciplinary research teams to the design of AHEDA MADSS.

Chapter 4 introduces the research methodology and the significant role of Service Design Thinking (SDT) tools in collecting and organizing data. Moreover, the research process is delineated across its four distinct stages:

- *Data Collecting* (Chapter 5), which involves the exploration of the prospective users and the provider organization to gather valuable data about their psychological and organizational world. This exploration - enabled by the adoption of *User Research* (specifically through narrative interviews) and *Strategic Organizational Counseling (SOC)* - provides the collection of relevant information that will serve as the basis for the subsequent analysis and modeling activity.
- *Data Analysis* (Chapter 6), which represents the analysis of the narrative interviews from *User Research* and the maieutic interviews from *SOC*. This analysis is carried out through the *Thematic Analysis* approach of Braun & Clarke (2006).
- *Data Modeling* (Chapter 7), which implies the modeling of DM processes and activities specific to the prospective users and the provider. This comprehensive modeling approach implies the systematization of data in a selection of SDT tools.
- *Data Bridging* (Chapter 8), which involves bridging the users and the providers not only aligning their respective activities and DM processes but offering a comprehensive and holistic framework to capture all the specificities - namely their *rules, tools, division of labor, community, objectives, and objects* - that influence each actor's DM process and impacts the creation of interobjectivity. This stage culminates in the creation of the *MADM model*.

Chapter 9 offers a summary of the key design implications emerged from the whole research process for the integration of AHEDA service.

Finally, the concluding section aims to address the main research questions of the project, emphasizing the results that have established this work as a valuable advancement in both theory and methodology for Human-AI integration in the field of IHC.

Part 1:

Literature Analysis

1. The complexity of Decision-Making for Investments in Human Capital: A Literature Review

Making investment decisions is usually considered a challenging task for investors, because it is a process based on risky, complex, and consequential choices (Shanmuganathan, 2020). Investing in any business implies the involvement of multiple factors, both external and internal to the decision-maker. External factors include the company's balance sheet, inflation, and prevailing interest rates (Sevdalis & Harvey, 2007; Oehler et al., 2018). Internal factors are mostly psychological and involve cognitive and affective levels (Statman, 2017), which influence the Decision-Making (DM) process. Moreover, investments may be classified into two categories: investments in the capital market, such as financial securities, bonds, and stocks, or *Investments in Human Capital* (IHC), which are investments interested in intangible assets, such as the set of knowledge, skills, and abilities of an individual (Schultz, 1961). Examples of IHC include startup funding (Marocco & Talamo, 2022) and organizational development (Marocco et al., 2023a; Marocco et al., 2023c), both aimed at cultivating human capital, whether through supporting startup teams or fostering the growth of employees within organizations. In IHCs, the aspect of DM becomes even more critical since different actors with varying behaviors and agencies are involved. This

kind of DM, defined as Multi-Actor DM (MADM), does not involve single individuals, neither a group of decision-makers belonging to the same social context, but different actors, or groups of different actors, who start from non-coinciding objectives and that, through a process of negotiation, should make their goals *compatible* - able to coexist -, *coordinable* - able to complement each other's -, *and convergent* - able to come closer together -, to reach a rewarding and mutual agreement (Marocco & Talamo, 2022). Starting from this premise, an initial literature review was conducted to investigate which psychological theories may be more effective in modeling MADM processes and providing tools for describing them. To conceptualize our theoretical model, we took the example of startup funding as our main reference point. This rationale guided our research in the realm of investments, employing targeted keywords like *"financial decision-making"*. However, the identification of this conceptual framework will be profoundly valuable also for the real case study addressed in this thesis, which deals with organizational development.

1.1 Classification and analysis of the literature

1.1.1 The traditional contribution of Cognitive Psychology to the study of financial DM

Our literature analysis was conducted within the Scopus database. Specifically, the aim of this literature review was exploring how psychology has traditionally contributed to the study of Financial and Investment DM until now. To this purpose, we inserted the keywords *"financial"* and *"decision-making"* without any filters searching within *article titles, abstract and keywords*. Preliminary research identified 35,511 papers, showing how widely studied and debated this theme is. To carry out further screening, we entered the keywords only by searching for *article titles*. This research identified 655 papers. Then, we uploaded the Scopus database on *Rayyan*, an Intelligent Research Tool, in order to optimize the papers' coding and selection. In total, 13 articles were deleted after the duplicate detection. In the end, the eligible articles (642) were coded into 3 classes (see **Fig. 1**):

- *Psychological articles in Behavioral Finance Research* (201 articles; 31,3 %): all those psychological articles aimed at contributing to Behavioral Finance research;
- *Other psychological articles on FDM* (6 articles; 0,9 %): those articles that, although of a psychological nature, do not fit within the research trend of Behavioral Finance;

- *Non-psychological articles on FDM* (435 articles; 67,8 %): all those articles belonging to other disciplines - such as computer science, mathematics, or engineering - that are not relevant for our purpose of investigation.

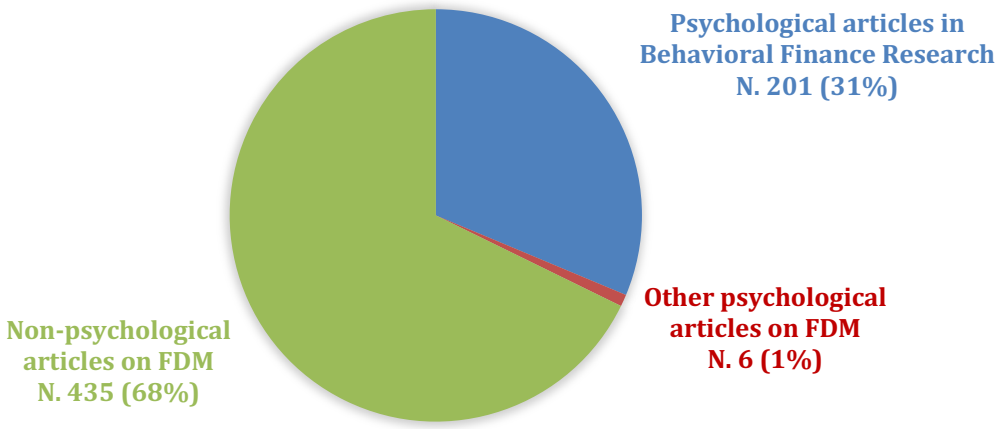


Fig. 1. *Classification of the eligible articles on FDM (searched on Scopus on 24/05/2022)*

Hence, considering only the psychological articles (**Fig. 2**), it comes out as evidence that the psychological contribution to the study of financial decisions, except for a very small part (6 articles; 2.9%), is aimed almost exclusively at the Behavioral Finance research line (201 articles; 97.1%), an interdisciplinary approach that includes scholars from the fields of Finance, Psychology (especially the branch of *Cognitive Psychology*[1]) and Sociology.

[1] Cognitive Psychology: the scientific study of cognition, or the mental processes that are believed to drive human behavior. Research in cognitive psychology investigates a variety of topics, including memory, attention, perception, knowledge representation, reasoning, creativity, and problem solving.

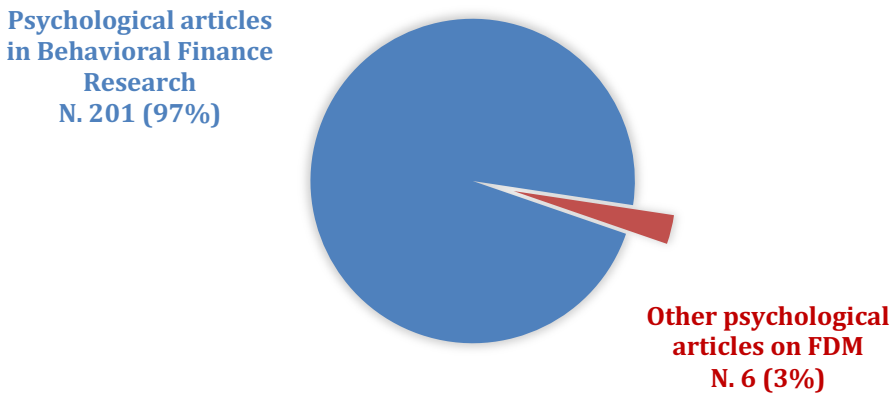


***Fig. 2**. Classification of psychological articles on FDM (searched on Scopus on 24/05/2022)*

Given the clear predominance of this approach to the study of FDM, for the purposes of our investigation we posed the question: does this theoretical perspective offer a contribution also in the field of IHC? To answer this question, we first define what Behavioral Finance is and which are the key concepts that led it to its success.

1.1.2 The Behavioral Finance Perspective: from rational to irrational individual FDM

The *Behavioral Finance* approach attempts to explain and increase the understanding of the reasoning patterns of investors, including the emotional processes involved and the degree to which they influence the DM process. *Essentially, behavioral finance attempts to explain the "what, why, and how" of finance and investing, from a human perspective* (Ricciardi & Simon, 2000). Researchers in this field argue that investors do not operate as fully rational decision-makers; instead, they are affected by psychological influences and

biases that could drive them to make irrational investment decisions (Niehaus & Shrider, 2014).

According to Pompian (2006), a pioneering researcher of the field, *Behavioral Finance* (which, by many definitions, is included in Behavioral Economics) can be divided in two primary subtopics:

- *Behavioral Finance Micro* (BFMI) which examines *behaviors or biases of individual investors,* distinguishing them from the rational actors envisioned in neoclassical economics[2];
- *Behavioral Finance Macro* (BFMA), which detects and describes *anomalies* in the efficient market hypothesis that behavioral models may explain.

One of the first investigators of BFMI was the economist and decision theorist Howard Raiffa, which in 1968 introduced to the decision analysis three approaches that provide a more accurate view of a "real" person's decision process:

- *Normative* analysis, concerning the rational solution to the problem;
- *Descriptive* analysis, dealing with the way real people actually make decisions;
- *Prescriptive analysis,* focused on practical advice and tools that may help people obtain results closer to those of normative analysis.

[2] Neoclassical economics: the term neoclassical economics was coined in 1900. It is based on the concept of *Homo economicus* as a simple model of human economic behavior, which assumes that principles of perfect self-interest, perfect rationality, and perfect information govern economic decisions by individuals.

1.1.3 The intellectual foundations of BFMI: Cognitive Bias Theory and Prospect Theory

Nevertheless, the most significant steps for the development of BFMI emerged from the result of *Cognitive Bias Theory* (Tversky & Kahneman, 1974) and *Prospect Theory* (Kahneman & Tversky, 1979), developed by both cognitive psychologists Daniel Kahneman and Amos Tversky during the 1970s. Their conceptualizations proved to be very helpful to economists for their attempt to model the way people actually make decisions instead of simply relying on the utility[3] DM strategies that had made up finance theory until then. Fundamentally, Tversky and Kahneman "*brought to light the incidence, causes, and effects of human error in economic reasoning"* (Pompian, 2006, p. 31).

More specifically, Tversky and Kahneman (1974) introduced the term *"cognitive bias"* to describe people's systematic but purportedly flawed patterns of responses to judgment and decision problems under uncertainty (Wilke & Mata, 2012). According to them, these biases begin as the consequence of the use of heuristics or simple cognitive principles that decision-makers adopt to reduce cognitive or computational requirements (Gigerenzer et al., 1999). In this way, the "*Heuristics and Biases program*", inspired by Herbert Simon's (1956) principle of *bounded rationality*[4], addressed the question of how people make decisions given their limited resources, due

[3] Utility: a construct in economics that measures an individual's expressed preferences for different decision alternatives.

[4] Bounded rationality: the principle that organisms have limited resources, such as time, information, and cognitive capacity, with which to find solutions to the problems they face.

to cognitive limitations, motivational factors, and/or adaptations to natural environments (Wilke & Mata, 2012).

The other intellectual foundation of BFMI is *Prospect Theory*. This theory names two specific thought processes: *editing* and *evaluation*. During the editing state, alternatives are classified according to a basic *"rule of thumb"*(heuristic). Then, a reference point is designated during the evaluation phase, which provides a relative basis for evaluating gains and losses. More specifically, through this conceptualization, Kahneman and Tversky (1979) stated that, under conditions of uncertainty, people make decisions based on the potential value of gains and losses rather than the utility, and that loss makes a greater emotional impact on investors than gain (the tendency of *loss aversion*[5]). Richard Thaler, who was already a finance theorist at the time, perceived and manifested the necessity to apply *Prospect Theory* to financial markets, becoming, together with Tversky and Kahneman, one of the founding fathers of Behavioral Finance.

1.1.4 Behavioral Biases for the analysis of individual FDM

Years later, a significant work fundamentally changed the decision theory of Raiffa (1968), contributing to the evolution of BFMI. Along with Mark Riepe, Kahneman (1998) wrote a paper entitled "*Aspects of Investor Psychology: Beliefs,*

[5] Loss aversion: the tendency to react more strongly to losses than gains.

Preferences, and Biases Investment Advisors Should Know About." Through this work, the authors categorized investors' biases - today also known as *behavioral biases* - on three levels:

- *Biases of judgment*, which include overconfidence, optimism, hindsight, and overreaction to chance events.
- *Errors of preference*, which contain a non-linear weighting of probabilities; the tendency of people to value changes, not states; the value of profits and losses as a function; the form and attractiveness of gambles; the use of the purchase price as a reference point; narrow framing; trends related to repeated gambles and risk policies; and the adoption of short versus long views.
- *Biases associated with living with the consequences of decisions*, which give rise to regrets of omission and commission, and have implications regarding the relationship between regret and risk taking.

Relevant research still seeks to classify behavioral biases according to some sort of meaningful framework. Some scholars refer to biases as heuristics (rules of thumb), while others mention them as judgments, beliefs, or preferences; still other authors classify biases along *cognitive* or *emotional* lines, where cognitive biases stem from faulty reasoning (such as anchoring and adjustment, availability, representativeness, ambiguity aversion, self-attribution, conservatism) and emotional biases originate from impulse or intuition rather than conscious calculations (such as endowment, loss

aversion, self-control) (Pompian, 2006, **Fig. 3**). It is noteworthy how, within this perspective, the term "*behavioral*" is often associated with the "*cognitive*" one; in fact, if in psychology "*mind*" and "*behavior*" assumes well disjointed meanings, in the economic language the boundary is often blurred. Similarly, the adjective "*emotional*" seems to be misused for defining what, in psychology, is termed as attitude (i.e., self-control), rather than emotion.

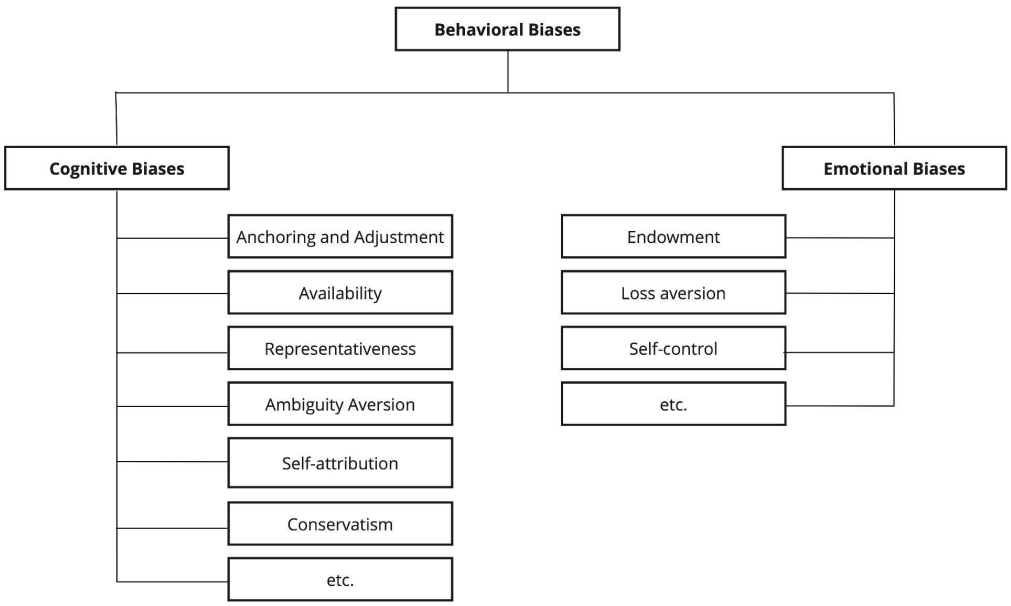


Fig. 3. *Example of Behavioral Biases' taxonomy (Pompian, 2006)*

Researchers in the field of BFMI have distinguished a long list of specific behavioral biases, applying over 50 of these to individual investor behavior (Pompian, 2006). Indeed, several studies have been carried out to identify significant behavioral biases and investigate their influence on individual FDM, offering a great contribution in the study of how investors, with their

limited resources, make decisions influenced by their previous experiences and the specific environment in which they are in. Indeed, more recent studies (Maxwell et al., 2011) have shown that angel investors use heuristic DM shortcuts known as elimination-by-aspects to reduce available investment opportunities to a more manageable dimension.

1.1.5 The contribution of Social Psychology in the study of group FDM under risk

If the great contribution of Cognitive Psychology in Behavioral Finance focuses on FDM mainly at the individual level, some aspects that may prove to be crucial in the study of financial decisions have been addressed by Social Psychology in the investigation of *choice shift* and *group DM (GDM) under risk* (Kameda & Davis, 1990).

When it comes to GDM, the most widely studied phenomenon is that of *social influence*. In this regard, it is important to make a distinction between two traditional strands of research: on the one hand, the study of how the group influences the decision of the individual group member; on the other hand, how the group takes a collective decision aimed at a common goal. The first research strand has been studied for a long time by applying the functionalist paradigm of Asch (1952) favoring the influence of the majority on the behavior of individuals. This dominant perspective was then contested by Moscovici (1976) who argued the need to consider the social influence as a conflict between majority and minority that can be solved with the prevalence of the

former, producing conformity, or of the second, producing innovation or, finally, with a reciprocal adaptation that gives rise to the elaboration of a norm (*normalization*). It is easy to understand how both points of view can be applied productively to the study of social influence in the area of economic and financial behavior.

The second line of research has recently acquired even more relevance since, in contemporary society, decisions are increasingly entrusted to groups - especially in the financial/investment field - assuming that group decisions are more reliable than individual ones (Mannetti, 2004). However, given the proven evidence of complex dynamics triggered during group discussions, a question arose in our minds: is this hypothesis justified? One of the most significant phenomena investigated by the financial literature on how groups take collective decisions is known in social psychology with the expression of "*group polarization*". This kind of social influence has been explored by Stoner in one of his studies (1968), finding that GDM, after group discussion, tends to be riskier than individual DM, a phenomenon that Stoner termed "*risky shift*". Therefore, he stated that, if the initial opinions of group members tend to be risky, group decisions would be riskier (Davis, 1973; Myers & Lamm, 1976; Lilienthal & Hutchison, 1979). On the other hand, Fraser, Gouge, and Billig (1971) found evidence also for a *cautious shift*, with groups advocating more conservative decisions than those of the individuals of the group. In other words, group discussions produce a strengthening of the prevailing initial

attitudes (Moscovici & Zavalloni, 1969), a *polarization* which is supposed to be produced by both the informational and normative social influence processes (Eagly & Chaiken 1993, p. 658).

Moreover, *group polarization* has been investigated in relation to *framing effects*[6] that affect the group's final decisions. Regarding this, in a study by Cheng and Chiou (2008), it was investigated whether group polarization effects reinforce framing effects. It was predicted that framing effects would be relatively stronger in GDM than in individual DM. More specifically, it was hypothesized that, after group discussions, the group polarization effect would lead decision-makers to show a lower preference for the risky option in gain situations and a greater preference for the risky option in loss situations than when they performed the investment decision task on their own. The findings of this study confirmed the hypotheses of the authors, suggesting that GDM on investments exhibits the same framing effects as individual DM, but that framing effects are more prominent in GDM situations than in individual ones (Cheng & Chiou, 2008).

[6] Framing Effect: Kahneman and Tversky (1979) define a framing effect as the decision-makers' framework of reference, which is determined by their conception and by the results and contingencies associated with that particular choice.

1.2 The identification of a gap in FDM theories: *missing models for IHC*

Collectively, what seemed to emerge from the analysis of the literature on FDM was that:

- The prevalence of studies is still unbalanced on the analysis of individual DM;
- Humans are often considered as bearers of biases and distortions;
- The majority of studies described one class of decision-makers: the investors;
- Psychology offers several models to study FDM, although the field of IHCs appears to be significantly less investigated than that of the capital market.

To understand why the existing study approach to financial decisions does not meet the requirements for the analysis of DM in IHC, it is necessary to define the main characteristics that differentiate it from other contexts of investment:

- *IHC does not involve only individual DMs.* Indeed, when it comes to IHC, most of the phenomena of psychological interest, including the DM practices, are irreducible to an individual analysis. Such analysis would risk losing sight of the social process interaction and the sharing of meanings, including cultural ones, which makes it possible to explain and describe the behavior and activities of individuals in real social

contexts (Mannetti, 2004). As Guerin (2003 p. 715) rightly argues, *"we cannot separate people from economic, social and cultural relations even if we keep them alone"* because the economic behavior of people that we want to study are in fact "formed" by these relationships.

- *IHC does not involve only GDM.* Indeed, IHCs may require the encounter of mixed individuals (i.e., an investor and a fund seeker; or an HR manager and an employee), or multiple groups (i.e., the management team of a Venture Capital Organization and a startup team; the HR management team of an organization and a training group), who start from not coincident objectives. Since groups in Social Psychology are defined as a collection of two or more individuals who interact with each other and share common goals and norms that guide their activities, developing a network of roles and affective relationships (Harré, Lamb, and Mecacci), theories on GDM can only partially explain IHC phenomena.
- *IHC is not a one-sided investment, but a mutual investment.* In fact, if for capital market investments the only category of decision-makers is represented by investors, IHC deals with at least two classes of decision-makers: those who invest and those who seek investments, both with agency and intentionality. For example, considering the context of startup funding, Venture Capitalists have to decide whether to invest their sum of capital and enter a company, but, at the same time,

startuppers have to decide whether to offer their resources and knowledge at the service of those Venture Capitalists rather than other lenders. Similarly, in the case of organizational development, HR managers and People managers have the task of selecting employees to invest in for organizational growth and development and the employees seeking development and training opportunities must make an important decision: how to invest their skills, ideas, time, and energy in the best way.

For those reasons, we define this kind of DM a **MADM** and suppose that, being a complex multilayer process, it requires a more inclusive theory that helps modeling the DM behaviors of all the actors involved in the decision process - meaning multiple individuals who, starting from different objectives, meet each other's to reach a mutual agreement (Marocco & Talamo, 2022).

1.3 Shared Reality Theory: a first model to the analysis of MADM

As seen above, one of the aspects of MADM that differentiates it from GDM is the lack of necessarily shared and common objectives among the decision-makers. According to us, an interesting theory that can be adapted to the study of MADM - with the aim of favoring the sharing of meanings among decision-makers - is that of *shared reality* (Echterhoff, 2012). Precisely,

according to Echterhoff and Higgins (2018), two well-known exponents of social cognition, shared reality is *the experience of having in common with others inner states about the world, that is the perceived relevance of something, as well as feelings, beliefs, or evaluation*s. As a result, the perception of inner states' commonality with others fosters the perceived truth of those inner states and intensifies the experience of making the right decision (Higgins et al., 2020). Therefore, shared reality goes beyond the mere duplication of another person's emotions, as in the case of *emotional contagion*[7] (Neumann & Strack, 2000). In this respect, shared reality requires mechanisms that allow people to deduce the inner state of their partner (Higgins & Pittman, 2008; Malle & Hodges, 2005). According to the literature, the mechanisms most commonly used to infer the inner states of others, such as beliefs and attitudes, include *conscious reasoning, unconscious simulation, and theory of mind* (Leslie et al., 2004); *causal theories and schemata* (Heider, 1958; Malle, 1999); and *projection of one's own inner states* (Keysar & Barr 2002; Nickerson, 2001). Until now, the concept of shared reality has been particularly relevant to Consumer Psychology, where consumers communicate with each other from word of mouth, through channels such as forums, blogs, and social media. Nevertheless, we believe that studies aimed at this scope could be of great

[7] Emotional Contagion: "the tendency to mimic and synchronize automatically facial expressions, vocalizations, postures and movements with those of another person and, as a result, converge emotionally" (Hatfield et al., 1992).

benefit even in undiscovered fields, such as the one of IHCs. Indeed, when it comes to such decisions, both kinds of decision-makers, the investors and the investment seekers, desire to reach a profitable agreement, despite starting from not necessarily coincident goals and beliefs. Encouraging the creation of shared realities during the communication between these two classes of decision-makers, not only serves to build a common ground, which implies a shared basic knowledge of the topic of the conversation, but also to allow communication actors experiencing matching inner states about the topic of the conversation, such as the feelings, beliefs, or evaluations of something (Echterhoff & Higgins, 2018). For example, there may be a common ground between investors and investment seekers, in the sense of a shared reference, regarding the perception of investors' selection criteria. Considering the case of startup funding, all the actors know that the evaluation of the business plan corresponds to a selection criterion. However, this would not necessarily mean that investors and investment seekers agree on their judgments or feelings about it. In fact, they might not even have shared relevance, because investors may think the business plan is a fundamental prerequisite, but investment seekers do not (**Fig. 4**).

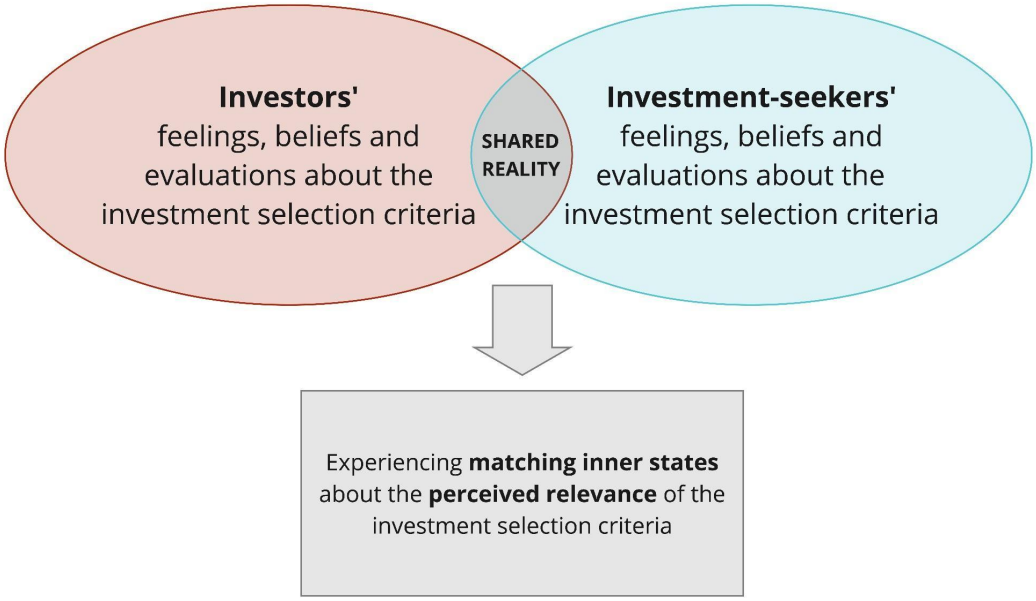


Fig. 4. *The experience of shared reality in a dialogue between investors and investment seekers*

Moreover, previous work has shown that people are particularly inclined to create *shared reality* with those they trust epistemically (Echterhoff & Higgins, 2017), with whom they feel connected (e.g., ingroup members; Echterhoff et al., 2005, 2008; Sinclair et al., 2005; or close partners, Rossignac-Milon et al., 2020; Rossignac-Milon & Higgins, 2018), or with a group of people with a common feeling or belief (vs. with an individual; Echterhoff et al., 2017; Higgins et al., 2007). Therefore, the absence of *trust* between the subjects of communication may represent a concrete barrier to the development of shared reality and may hinder the success of the agreement. For this reason, it is worth mastering these psychological mechanisms when dealing with MADM in IHCs.

1.4 Cultural Psychology and Activity Theory for modeling complex MADM

If Shared Reality Theory offers a contribution in the study of MADM mostly in terms of communication - explaining how particular mechanisms may help inferring the sharing of inner states to develop an experience of commonality -, we believe this theory could benefit from integrations with other approaches to describe all the complex components of MADM. In this regard, we assume that the study of such decision processes could really take advantage by considering some conceptualizations from Socio-Cultural Psychology and Activity Theory (AT) (Leont'ev, 1974, 1978; Engeström, 1987, 2001).

1.4.1 Activity Theory: a conceptual framework to understand networks of interacting activity systems

While Cognitive Psychology studies the individual and intrapsychic processes, and Social Psychology, in particular the branch of Social-Cognition, focuses on social influence and group biases, Socio-Cultural Psychology, more specifically AT, shifts the focus of the unit of analysis not on the individual, nor on the group, but on the "*activity*" itself, understood as a finalized, transformative, and developing interaction between the actors ("*subjects*") and the world ("*objects*"). All these aspects can also be conceptualized as meaningful *choreographies* (Talamo et al., 2016). In fact, as the anthropologist

Duranti coherently affirms, "*a meaning does not exist independently of its activity; not considering this aspect means studying psychological activities that are produced by experimental situations, not very representative and far from real situations"* (Duranti, 1997).

From its first formulation to the present day, it is possible to identify three generations of AT. The first generation was based on Vygotsky's (1978) idea of mediation (*Subject-Artifact-Object*[8]), further developed by Leont'ev (1978) and usually sketched in the form of an activity triangle. According to Engeström (2001), the example of primordial collective hunting[9] of Leont'ev (1981) represented a first turn towards the social AT, since it explained the difference between individual action and collective activity. Thus, Engeström (1987) took this reference to lay the groundwork for identifying the second generation of AT, called the *"Activity System Model"* (**Fig. 5**).

[8] Subject-Artifact-Object: the subject is the person studied, the object is the intended activity, and the artifact is the mediation tool with which the action is performed.

[9] Collective hunting: an example of collective activity proposed by Leont'ev. A member of the hunting party acts as a drum beater to scare the animal. This action seems at first glance contradicting the purpose of the hunt. However, its purpose is actually to guide the animal to a place where other hunters are lurking. The action of the drum beater clearly plays a role in the realization of the general activity of the hunt. As such, it is essential that researchers reveal the true object of an activity under investigation through scientific analysis.

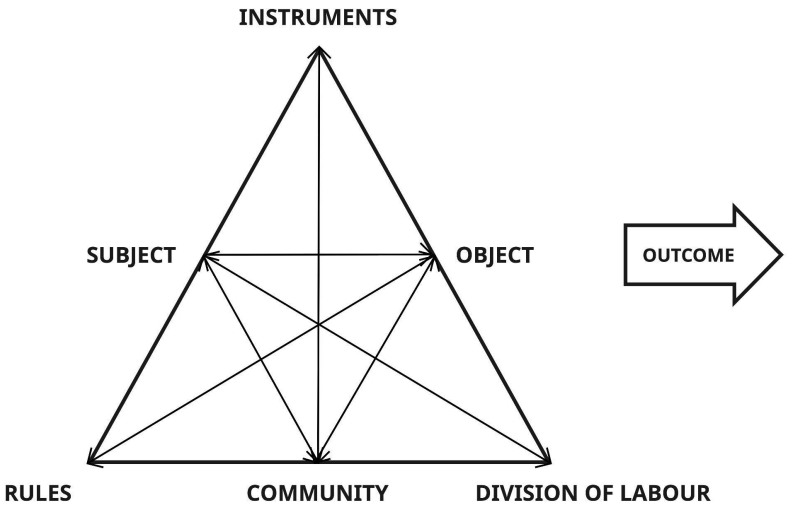


Fig. 5. *II generation of AT (Engeström, 1987)*

Through the second generation of AT, Engeström (1987) expanded the *Subject-Artifact-Object* triangle, by adding three new elements of complexity. The first is *rules*: sets of conditions (formal and/or informal) that help determine how and why individuals can act and are the result of social conditioning. The second is *the division of labor* (roles and tasks), which involves the distribution of actions and operations among a community of workers. These two elements influence a new plane of reality known as *community*, through which groups of activities and teams of workers are anchored and can be analyzed (Hyland, 1998; Verenikina, 2001). Due to its social nature, the second generation of AT incorporates the idea of internal contradictions as driving forces for change and development in activity systems. This framework was further developed by the third generation of AT (**Fig. 6**), addressing the challenge of developing *"conceptual tools to understand dialogue, multiple*

perspectives, and networks of interacting activity systems" (Engeström, 2001, p. 135).

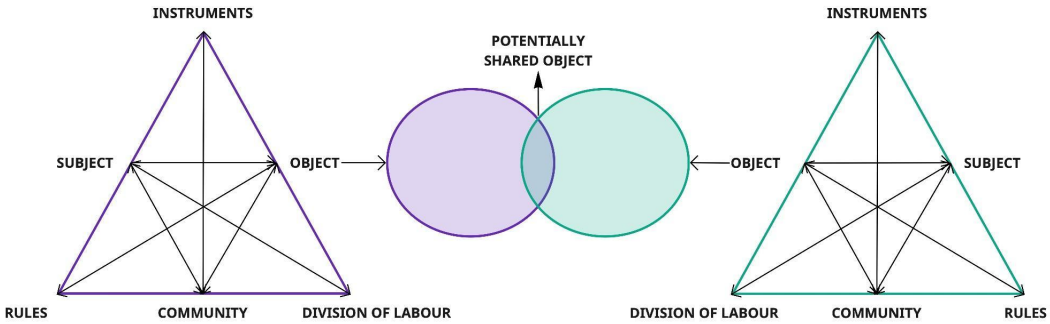


Fig. 6. *III generation of AT (Engeström, 2001)*

This last generation of AT is grounded on five key principles that should be taken into consideration when this framework is used to analyze complex social contexts:

- *Openness:* the main unit of analysis for research is the *artifact-mediated system of activity*, seen as part of a network that includes its relationships with other systems of activity. Therefore, *"goal-directed individual and group actions, as well as automatic operations, are relatively independent but subordinate units of analysis, eventually understandable only when interpreted against the background of the entire activity systems* (Engeström, 2001, p. 136).

- *Multivoicedness*: polyphony is an intrinsic property of activity systems. Therefore, activity systems are communities that incorporate multiple points of view, traditions, and interests (Engeström, 2001).
- *Historicity*: the features and the potential of activity systems can only be understood with respect to their own historical framework, since they are continuously shaped over time, along their history (Engeström, 2001).
- *Contradictions***:** activities are open systems interacting with each other. Contradictions are seen as *"historically accumulating structural tensions within and between activity systems"* and therefore they constitute the major driver for change and development (Engeström, 2001, p.137).
- *Expansive transformation*: the possibility of a radical transformation within the activity systems is closely related to the afore-mentioned properties. Indeed, over time, openness and multi-voicing produce contradictions. Since contradictions are embedded in the activity of individual participants, they initiate a process of deviation from the established norms of the systems, which may trigger and deliberate a collective change in the system (Engeström, 2001).

3.2.3.1 The concept of "shared object"

Furthermore, the core of this theoretical reconceptualization regards the concept of *object*, which is defined by Engeström as "*a project under*

construction, moving from potential raw material to a meaningful shape and to a result or outcome" and as what *"determines the horizon of possible goals and actions"* (Engeström 1999c, p. 65). In the third generation of AT, Engeström describes the object as a potentially shared or jointly constructed object. This is particularly important when considering IHC in the organizational context, since organizations center their activities around objects that are *partly shared, partly fragmented, possibly contested, and certainly emergent, and because objects of activity are likely to be rooted in multiple activity systems, they may not be at all easy to change in the short term* (Sannino et al., 2009, p. 27*).* This means that across multiple activity systems, there can be shared horizons of specific goals and actions. The object, indeed, serves as a point of convergence, where different activity systems may align their objectives and actions towards a potential and partial shared purpose. When multiple activity systems share a common orientation towards the same object, this can lead to the creation of *interobjectivity*. Moghaddam (2003) introduced the concept of *interobjectivity*, referring to two distinct levels of analysis. Firstly, within groups, interobjectivity describes the shared meanings and understandings of objective reality that individuals have within the same cultural context. It highlights how people within a group develop a common understanding of certain objects. Secondly, between groups, interobjectivity refers to the representation of an object that incorporates diverse social meanings existing among different cultural groups. According to Moghaddam (2003, p. 230), it

is practical experiences that lead different individuals or groups to recognize that *"...through the various collaborative tasks (...) it is possible to understand others, and for them to understand us"*. Therefore, the concept of interobjectivity directs attention towards the collaboratively constructed world outside individuals and views subjective understandings as emerging from participation in collective processes. As a result, Talamo and Pozzi (2011, p. 304), building upon Moghaddam's definition (2003), interpret interobjectivity as *"the common orientation of participants towards a practical goal and as the process by which a practical activity is jointly undertaken by different subjects"*. Consequently, objects that belong to multiple activity systems, as in the case of MADM, require analytical work to identify the various points of convergence that enable their compatibility and potential sharing. This approach seeks to verify how specific objectives of the subjects involved may align towards a shared and unified vision: the *shared object*.

Because of its interactive and multi-voice nature, we consider the third generation of AT (Engeström, 2001) as the most appropriate model to explain the MADM construct (Fig. 7). Especially if the creation of these diagrams comes from a specific sequence of activities aimed at modeling the DM processes of different activity systems, as we will demonstrate in the *Part 2* of this thesis dedicated to methodology and results.

2. The integration of Artificial Intelligence in Managerial Decision-Making

2.1. AI role in DM: state of art

In today's society, the complexity of DM has led various disciplines and researchers to engage with this subject, aiming to identify technological solutions that can assist individuals in overcoming their challenges. In this regard, the advent of advanced AI technologies, such as machine learning, deep learning, and natural language processing, has introduced a new dimension to the DM process, with AI gradually assuming responsibilities that were traditionally performed by humans (Vincent, 2021).

An important driving factor contributing to the recent increase in interest in human-AI DM is the expanding capacity of AI models in supporting decision processes. Within this domain, the three most commonly used AI models are: *deep models*, *shallow models*, and the *Wizard of Oz* (Lai et al., 2023).

Deep Models are often used in studies on human-AI DM (Alqaraawi et al., 2020; Cai et al., 2019). These AI models are based on deep learning, often consisting of neural networks with more than two layers. They are known for their ability to perform a wide range of tasks and may even outperform humans in some cases. However, their systems are complex and often challenging to interpret directly, which may raise concerns about user trust.

Shallow Models are less complex than deep learning models and are also easier to train and debug. They often include traditional additive models, such as logistic and linear regression. In some cases, shallow models can achieve competitive performance compared to deep models, especially when dealing with a limited number of features (Abdul et al., 2020; Biran & McKeown, 2017)

Wizard of Oz is a research method in the field of Human-Computer Interaction where researchers simulate the output of an AI model instead of using a real one. This approach is useful when conducting user studies without developing a complete AI model. Researchers manually control the simulated output, giving them full control over the model's behavior and the ability to vary different aspects of the output for specific experiments. Researchers have used the Wizard of Oz method with fictional cases of model predictions and explanation styles (Anik & Bunt, 2021; Binns et al., 2018; Buçinca et al., 2020). However, it is important to design Wizard of Oz studies realistically to ensure that the results are valid and generalizable.

Thanks to these AI models, AI-based systems possess the capability to autonomously learn and uncover hidden insights from data, enabling individuals to make decisions that demonstrate rational superiority (Jovanovic et al., 2021; European Commission, 2018). Indeed, algorithms, defined by Lindebaum et al. (2020) as *"super-carriers of formal rationality"*, offer several advantages over human decision-makers, including the ability of

processing large volumes of data, rapidly analyzing data, and replicating logical and mathematical processes. For these reasons, AI-based DM is considered more efficient, accurate, and flexible (Agrawal et al., 2017; Deloitte, 2019; Metcalf et al., 2019). AI applied to DM processes has already been implemented in many fields (Galiano et al., 2019; Triberti et al., 2020; Bayrak et al., 2021), including finance, banking, healthcare, justice, and human resource management (Mahmud et al., 2022). Within organizations, AI technologies are on the rise (Phillips-Wren, 2012; Shrestha et al., 2019), offering powerful resources in organizational DM (Mahmud et al., 2023). In this context, Decision Support Systems (DSS) have emerged as crucial tools in aiding management across various activities, including planning and operational execution (Gupta et al., 2020). With a focus on the broader scope of organizational decisions, AI can be employed to *"support decision-making and knowledge management and automate customer interfaces"* (Brock & von Wangenheim, 2019, p.115). Nevertheless, the realization of human-AI collaboration in the organizational context strongly depends on the managers' level of AI acceptance (Edwards et al., 2000; Mathieson, 1991). Indeed, despite the aforementioned qualities and the evident advantages that AI can bring, algorithms are still met with skepticism by a large number of managers, hindering the full realization of the potential benefits of AI-based decisions within organizations (Mahmud et al., 2022). In general, this issue has given rise to varying perspectives, sparking debates among professionals and

researchers, so that we can distinguish *techno-enthusiasts*, the true believers and supporters of technology and post-humanity, and *techno-skeptics*, who are more cautious and critical about future AI implementation in DM (Talamo et al., 2021). These two divergent positions can be differentiated by focusing on specific issues:

- **Objectivity of AI vs Subjectivity of human-beings:** On the one hand, *techno-enthusiasts* believe that the objectivity conferred by technology is an added value because it reduces the variability of human error. Specifically, they argue that algorithmic DM processes can lead to more objective decisions than those made by humans, which may be influenced by individual bias, conflicts of interest, or fatigue (Lepri et al., 2021). On the other hand, *techno-skeptics* firmly state that machines can only partially simulate, but never duplicate, humans' unique mental life: in fact, machines cannot feel or understand the complexity of real-life situations (Postman, 1993). Furthermore, in this perspective, the objectivity of AI and other intelligent technologies fails in making decisions with uncertain circumstances. As a matter of fact, although AI systems can assist human decision makers with predictive analytics, they are less capable of understanding common-sense situations (Guszcza et al., 2017) and unpredictable environments, particularly outside of a predefined domain of knowledge (Brynjolfsson & McAfee, 2012).

- **The lack of transparency of AI:** Another issue largely discussed, both by the users and the researchers, is the lack of transparency of AI. In this regard, the most skeptical criticize algorithmic DM processes for the threat of privacy invasion, information asymmetry, and discrimination (Lepri et al., 2021). Moreover, artificial intelligence and algorithmic DM processes are increasingly challenged for their black-box nature: most users, indeed, have little awareness and knowledge of how artificial intelligence systems make decisions. Hence, the lack of transparency hinders comprehension and negatively affects trust (Shin, 2021).
- **Augmentation vs Automation:** Looking at the literature, we seem to find evidence of a widespread fear of automated DM systems prevailing over human beings. As a result, people are becoming even more apprehensive, fearing that they may soon be taken over by intelligent machines. In this regard, Stephen Hawking has noted that "*the development of full artificial intelligence could spell the end of the human race*" (Cellan-Jones, 2014), and Bill Gates has also stressed that humans should be concerned about the threat caused by AI (Rawlinson, 2015; in Duan, 2019).

However, despite the extensive literature available on issues related to human-AI integration, the investigation within the specific organizational domain remains relatively unexplored. Consequently, we decided to conduct

a systematic literature review to examine the aspects that may facilitate or hinder the incorporation of AI-based systems in the field of managerial decisions.

2.2 Exploring Facilitators and Barriers to Managers' Adoption of AI-Based Systems in Decision-Making: A Systematic Review

As previously introduced, this systematic review (Marocco & Talamo, 2023) aims to identify the factors that influence managers' perceptions and acceptance of AI within the organizational context, shedding light on both facilitators and barriers. The subsequent sections detail the applied methodology and present the resultant findings.

2.2.1 Material and Methods

2.2.1.1 Source of information and search strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist was used to conduct the research, to identify the factors that influence the adoption of AI in managerial DM. After creating a review strategy, we conducted the database search in Scopus. We used the following search terms, incorporating alternative words and combining them using Boolean operators: (("artificial intelligence" OR "AI" AND "decision-making" OR "decision" OR "managerial decision-making" AND "manager" AND "adoption" OR "acceptance" OR "intention" OR “aversion")).

2.2.1.2 Eligibility criteria

This review contains 8 original papers that examined the factors influencing managers' acceptability of using AI for managerial decisions. This study covered studies that were openly available in full-text, published in English-language between 2010 and 2023 (since the interest in algorithms became particularly prominent and widespread in the 2010s). Studies that lacked comprehensive texts, weren't published in English, were published before 2010 or didn't address managers' acceptance to use AI systems within organizational context were excluded (see **Tab. 1**).

	Inclusion criteria	**Exclusion criteria**
Language	English	Non-English
Publication type	Article	Review, Conference Review, Conference Paper, Book Chapter, Book
Time Frame	2010 - 2023	< 2010
Focus	Studies that investigate factors affecting adoption and usage of AI in DM by managers	Studies that do not address factors affecting AI adoption and usage in DM by managers
	Studies that focus on the application of AI in the organizational context	Studies not applied to the organizational context

***Tab. 1** Inclusion and Exclusion Criteria*

2.2.1.3 Data extraction and analysis

The records extracted from the Scopus database were imported into the *Rayyan.ai* software, an Intelligent Research Tool. This software enabled the

analysis of all the records based on titles and abstracts, providing an intelligent coding system. This review employed a combination of experimental, empirical, quantitative, analytical, and observational methods to examine the factors influencing the acceptance of AI-based systems in managerial DM.

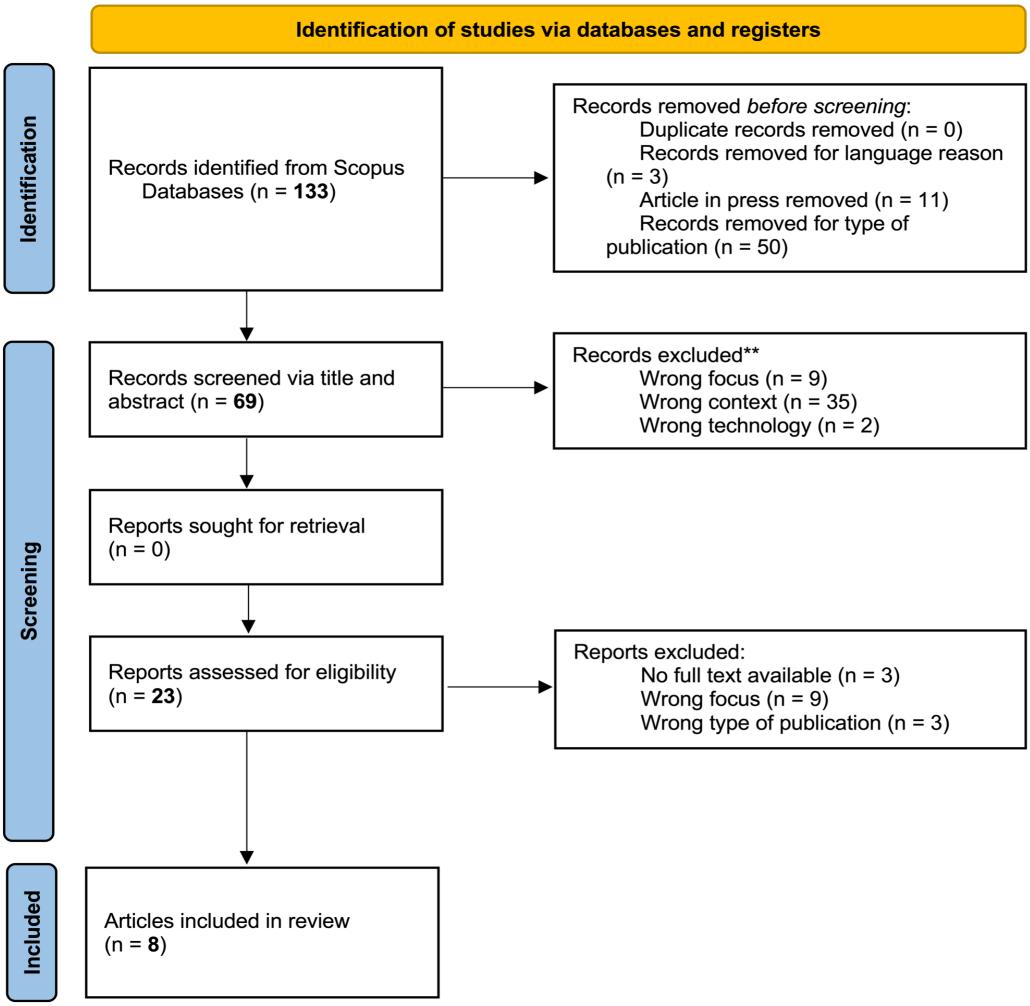
2.2.2 Results

2.2.2.1 Study selection

A systematic search was conducted in the Scopus database, identifying a total of **133** records. These records were uploaded into *Rayyan.ai* software, in order to optimize the papers' coding and selection. Duplicates were checked, resulting in 0 duplicates. 3 records were excluded due to language limitations. Additionally, 11 records were excluded as they were "*articles in press*", and 50 records were removed based on their publication type (see **Tab. 1**). Among the initially identified records, 46 were subsequently excluded following the title and abstract screening. More specifically, 9 articles were considered out of focus as they did not address managers' acceptance to use AI within the organizational context; 35 articles were deemed in the wrong context as they pertained to hospital and medical settings, which were too specific for generalizing to the corporate environment; and 2 were considered with wrong technology due to their focus on robot advisors, whereas our interest lies in

AI-based DSSs. After the full-text screening using the predefined inclusion and exclusion criteria, an additional 12 records were considered ineligible and removed (9 for the wrong focus and 3 for the wrong type of publication), while 2 were removed since they were not available in full text. Ultimately, **8** papers were included in the study, meeting the established criteria (**Tab. 1**). Below, we present the PRISMA flowchart depicting the article selection process (**Fig. 1**).

Fig 7. *PRISMA flowchart showing the selection process of the articles*



2.2.2.2 Characteristics of included studies

The **Table 2**, produced by *Bibliometrix* software, offers insights into the included dataset. It covers the period from 2021 to 2023 and originates from 7 different sources. The dataset consists of 8 documents in total, all categorized as articles. The data shows an average of 21.12 citations per document.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2021:2023
Sources (Journals, Books, etc)	7
Documents	8
Annual Growth Rate %	-42,26
Document Average Age	1,25
Average citations per doc	21,12
References	814
DOCUMENT CONTENTS	
Keywords Plus (ID)	60
Author's Keywords (DE)	38
AUTHORS	
Authors	25
Authors of single-authored docs	2
AUTHORS COLLABORATION	
Single-authored docs	2
Co-Authors per Doc	3,12
International co-authorships %	62,5
DOCUMENT TYPES	
Article	8

Tab. 2. *General information about the records included*

2.2.3 Facilitators and barriers to managers acceptance of AI systems in organizational DM

In this systematic review, a total of 17 facilitators and 11 barriers have been found in the 8 studies. **Table 3** provides an overview of the identified records, offering essential insights such as authorship, publication year, study type, sample size and sample characteristics. Additionally, the table outlines the facilitators and barriers that were examined and validated in these studies.

Authors and Publication Year	Study Type	Study population	Sample size	Facilitators	Barriers
Cao et al., 2021	Quantitative	UK business managers	269	Facilitating conditions, Performance Expectancy, Effort Expectancy, Attitudes	Personal Well Being Concern, Personal Development Concern, Perceived AI Threat, Perceived AI Severity, Perceived AI Susceptibility, Attitudes
Gerlach et al., 2022	Analytical	X	X	Explainable AI Design	
Haesevoets et al., 2021	Empirical	Managers	1025	Human primacy in Human-AI collaboration	
Leyer & Schneider, 2021	Experimental	Managers	1246		Perceived Adaptability, Lack of Trust, Desire for control, Self-overconfidence
Mahmud et al., 2023	Quantitative	Managers of 31 banks/ financial institutions in Bangladesh	179		Tradition Barrier, Image Barrier, Value Barrier
Rodríguez-Espíndola et al., 2022	Observational	Practitioners working on operations management, project management and risk and crisis management	117	Level of Digital Transformation, Organizational Resilience, Regulatory Guidance and Market Pressure	
Van Phước, 2022	Quantitative	Senior managers in Vietnam	193	Managerial Capability, Managerial Support, Organizational Readiness, Government Involvement, Vendor Partnership	
Vărzaru, 2022	Quantitative	Romanian accountants	396	Perceived Ease of Use, Perceived Usefulness, User Satisfaction, Behavioral Intention	

Tab. 3. *Overview of included studies*

The identified facilitators and barriers are described below grouped into thematic categories. Facilitators are classified within the following 9 categories:

1. **Organizational Factors:** Organizational Readiness, Level of Digital Transformation, Organizational Resilience;
2. **External Factors & Environment:** Government Involvement, Vendor Partnership, Regulatory Guidance, Market Pressure;
3. **Managers Expectancies and Facilitating Conditions:** Performance Expectancy, Effort Expectancy and Facilitating Conditions;
4. **Explainable AI Design**;
5. **Managers Perceptions of AI:** Perceived Ease of Use, Perceived Usefulness;
6. **User Satisfaction**;
7. **Attitudes**;
8. **Behavioral Intention**;
9. **Human-primacy in DM**.

Whereas, barriers are classified within the following 4 categories:

1. **Psychosocial Factors:** Tradition barrier, Image barrier;
2. **Psychological Factors:** Personal Well Being and Personal Development Concerns; Desire for control, Self-overconfidence;
3. **Managers Perceptions of AI:** Perceived Threat, Perceived Severity, Perceived Susceptibility, and Perceived Value;
4. **Lack of Trust in AI**.

Each of the aforementioned factors is delineated below, categorized into two distinct sections: facilitators and barriers. Furthermore, it is important to recognize that the categorization of factors as facilitators or barriers depends on the perspectives of the studies included. The concept of trust, for instance, can be conceived as both a positive and negative factor influencing the adoption of AI, depending on how it is perceived by the individuals involved. For improved clarity and ease of understanding, the results have been visually consolidated and summarized in **Figure 2**. The categories of facilitators are depicted in green, barrier categories are highlighted in red, and categories exhibiting both facilitators and barriers are marked in orange. This visual representation also presents the intricate relationships of the discussed factors.

Fig. 8. *Summary of results*

2.2.3.1 Facilitators

1. **Organizational Factors**

Organizational Readiness: The study by Van Phước (2022) emphasizes the significance of organizational readiness in the context of AI adoption. This readiness encompasses technological aspects like infrastructure, data structure, but also the skills of people resources. Indeed, the availability of AI expertise, the necessary data for training personnel in AI utilization, and technical understanding play crucial roles in promoting the spread of AI within organizations. In this perspective better-prepared organizations appear to achieve higher levels of AI adoption among their managers.

Level of Digital Transformation: The study conducted by Rodríguez-Espíndola et al. in 2022 highlights the positive impact of companies' engagement in digital transformation on the promotion of cutting-edge and disruptive technologies. Digital transformation entails the reconfiguration and progression of processes, activities, and skills to take advantage of emerging technologies (He et al., 2020). Indeed, organizations possessing greater technological expertise and knowledge tend to be early adopters, as they are better equipped to comprehend new technologies in their early stages (Geroski, 2000). The findings from Rodríguez-Espíndola et al.'s study (2022) reveals a positive correlation between digital transformation and both perceived usefulness and perceived ease of use of AI technologies by

managers. These perceptions, aligning with the Theory of Acceptance Model[10] (TAM) (Davis, 1989), revealed to significantly influence the intention to use AI-based solutions.

Organizational Resilience: Organizational resilience stands as a key element in empowering business plans, establishing preparations, developing strategies for emergency operations, responding effectively to unforeseen disruptions, and achieving efficient recovery from such disruptions (Macdonald et al., 2018; Sheffi, 2007). Within the context of disruptive technologies like blockchain and AI, Rodríguez-Espíndola et al. (2022) emphasize the crucial role played by organizational resilience, which showed a positive effect on the behavioral intention of managers to adopt both technologies. Resilient organizations characterized by flexibility and adaptability possess a competitive advantage in successfully integrating less conventionally adopted technologies. This underscores the importance of cultivating resilience as a core attribute for organizations aspiring to embrace advanced technologies and navigate the dynamic technological landscape.

2. External Factors & Environment

Government Involvement: The study of Van Phước (2022) highlights the significant roles that government involvement play in the adoption of AI-

[10] *Theory of Acceptance Model:* predicts individual adoption and use of new technologies in a work context; it establishes that the intention to use new technologies is based on two factors: perceived usefulness and perceived ease of use (Davis, 1989).

based solutions by managers within organizations. Government involvement is crucial in promoting IT innovation, as highlighted by Wang et al. (2022). The government can implement strategies and supportive policies to encourage the commercialization of new technologies, as well as introduce new regulations for their development. According to Al-Hawamdeh and Alshaer (2022), the adoption of new technologies is a complex process, and the regulatory framework established by the government is extremely important.

Vendor Partnership: The research conducted by Van Phước (2022) also highlights the influence of vendor partnerships on AI adoption. According to Assael (1995), vendor involvement can significantly impact the rate of adoption and diffusion of AI solutions within organizations. Indeed, vendors require a substantial amount of data to train their AI technologies, which often include sensitive consumer information. As a result, suppliers often need to closely collaborate with companies to provide AI training both during and after implementation.

Regulatory Guidance: Rodríguez-Espíndola et al. (2022) validated the profound influence of external factors on managers' perceptions of technology adoption. In particular, regulatory guidance can greatly shape the perceived ease of using emerging technologies. In fact, regulatory guidance and support offer managers more information about emerging technologies, thus providing

additional insights into their utility and reducing the uncertainty that could otherwise lead to user insecurity.

Market Pressure: market pressure, which prompt firms to strategically plan their operations and innovate their processes (Paulraj & Chen, 2007; Thanki & Thakkar, 2018), also emerges as a considerable influencing factor on the perceived usefulness of AI technologies (Rodríguez-Espíndola et al., 2022). Both the perceived ease of use and perceived usefulness, as stated before, stand as significant facilitators for managers' intention to use this technology.

3. Managers Expectancies and Facilitating Conditions

Performance Expectancy, Effort Expectancy and Facilitating Conditions: The study conducted by Cao et al. in 2021 delves into the role of managers expectancies and facilitating conditions in promoting the adoption of AI technologies. Specifically, the research builds upon the concept of Performance Expectancy, which refers to the individual's belief in AI's capacity to enhance job performance, as outlined by Venkatesh et al. (2012). This element was found to significantly influence AI adoption intentions. Furthermore, the study confirms the influence of Effort Expectancy, representing the perceived ease of using AI technology (Venkatesh et al., 2012). Furthermore, facilitating conditions - which refer to the extent to which an individual believes that an organizational and technical framework exists to support the use of AI (Venkatesh et al., 2012) - exert a positive influence on Performance and Effort Expectancies. Consequently, as facilitating conditions, organizations must

ensure the availability of enabling technologies and infrastructures (e.g., Dwivedi et al., 2021; Schoemaker & Tetlock, 2017), provide appropriate training and support (e.g., McKinsey, 2017) and equip managers with the requisite knowledge and technological skills to effectively engage with AI-based systems (e.g., Ransbotham et al., 2017; Schoemaker & Tetlock, 2017).

4. Explainable AI Design

Gerlach et al. in 2022 discuss the importance of Explainability for the design of AI. The researchers highlight the significant barrier posed by the black-box nature of AI models and their associated limitations in terms of explainability. To address this challenge, the concept of Explainable AI emerges, which aims to enhance the transparency of AI models. For XAI to be effective, it needs to possess certain attributes. These attributes encompass trustworthiness, which denotes the confidence of whether a model will act as intended when facing a given problem (Lipton, 2018); confidence, which is assessed on a model in which reliability is expected; transferability, which pertains to the capacity to improve or reuse the knowledge of the AI-based model (Lipton, 2018); fairness, which addresses efforts to avoid the unfair or unethical use of algorithm's outputs (Lipton, 2018); and accessibility, which allows end users to get more involved in the process of improving and developing a certain ML model (Craven, 1996). These qualities are generally required to fulfill the needs of a range of stakeholders - such as managers, regulators, users of XAI models, developers, and consumers.

5. **Managers' Perceptions of AI**

Perceived Ease of Use and Perceived Usefulness: The study conducted by Vărzaru in 2022 provides robust validation of the influential roles played by both Perceived Ease of Use and Perceived Usefulness in shaping managers' behavioral intention to adopt AI solutions. The originality of this research derives from the introduction of the modified TAM model concerning the acceptance of AI technologies for management. The findings underscore that users' perceptions of the ease of using AI solutions and their perceived usefulness significantly impact their intention to use these technologies. In essence, when managers find AI solutions user-friendly and beneficial to their tasks, they are more inclined to express an intention to adopt them. Furthermore, the study reveals significant insights into the determinants of Perceived Ease of Use and Perceived Usefulness. Among these antecedents, rapidity and innovation emerge as the most significant factors. This suggests that the speed at which operations can be carried out and the incorporation of innovative features within organizations play crucial roles in influencing managers' perceptions of AI solutions.

6. **User Satisfaction**

Vărzaru (2022) also affirmed the significance of user satisfaction, stated after the use of AI, as a powerful driver of AI adoption. In fact, his study indicates that user satisfaction positively influences both the intention to use and the actual use of AI solutions. In essence, this implies that when managers derive

satisfaction from their interactions and experiences with these solutions, their propensity to use them in the future and to consistently engage with them is significantly heightened. This finding underscores the essential role of user satisfaction in shaping the adoption trajectory of AI solutions in managerial DM.

7. **Attitudes**

In accordance with Cao et al. (2021), the established connection between attitude and intention to use is validated, thereby providing robust empirical evidence for the intrinsic relationship between these constructs. This finding not only corroborates prior research but also reinforces the significance of attitudes in influencing users' intentions to adopt technology. Furthermore, the study reaffirms the impact of Performance Expectancy, which refers to AI's capacity to enhance job performance, and Effort Expectancy, which pertains to the perceived ease of use of AI, in shaping attitudes.

8. **Behavioral Intentions**

According to the Theory of Planned Behavior (Ajzen, 1991), which also served as the foundation for TAM (Technology Acceptance Model) (Davis, 1989), behaviors are influenced by intentions. These intentions are determined by three key factors: attitudes, subjective norms, and perceived behavioral control. Behavioral intentions represent the motivational factors that shape a particular behavior, with stronger intentions leading to a higher likelihood of the behavior being carried out. Vărzaru (2022) has provided confirmation that

the behavioral intention to adopt AI-powered solutions is directly correlated with increased actual usage of these solutions. This implies that managers who exhibit a strong intention to use AI solutions are more likely to translate that intention into tangible and frequent usage of the technology.

9. Human-primacy in DM

The research conducted by Haesevoets et al. (2021) shed light on how human managers view machine involvement in DM. While managers tend to resist a scenario where machines take the primary role, the study also highlighted that they are open to machine participation as long as machines provide less input than humans. These findings are in line with prior research findings, such as those of Bigman and Gray (2018), who noted that people are more comfortable with machines in advisory roles, and Dietvorst et al. (2018), who observed greater acceptance of machine-generated input when individuals retain control over the final outcome. However, this current study goes a step further by precisely identifying the optimal balance between human and machine involvement. Indeed, it was found that managers are more willing to accept machine participation as human influence in the final decision increases, up to around 70% influence. This degree of influence was assessed through five empirical studies conducted on a sample of 1025 managers. Beyond this percentage, additional human input does not necessarily lead to higher acceptance rates.

2.2.3.2 Barriers

1. **Psychosocial Factors**

Tradition and Image barriers: The investigation carried out by Mahmud et al. in 2023 analyzed the impact of some psychosocial factors, namely Tradition barrier and Image barrier, on the phenomenon of *algorithm aversion* among managers. Tradition barriers manifest when individuals are confronted with the necessity to deviate from long-standing societal norms due to the introduction of innovation. This often triggers resistance, characterized by behaviors such as negative word-of-mouth, boycotts, and opposition (John & Klein, 2003). Conversely, Image barriers pertain to the unfavorable perceptions of innovations deriving from preconceived, stereotypical notions held by users (Ram & Sheth, 1989).

The research findings prominently indicate that managers who perceive elevated levels of tradition and image barriers tend to exhibit a higher degree of aversion towards the adoption of AI-based solutions. This aligns with the existing body of literature (Gupta & Arora, 2017; Laukkanen, 2016; Leong et al., 2020; Lian & Yen, 2014; Ma & Lee, 2018; Moorthy et al., 2017), establishing a consistent pattern across various studies. The presence of these psychosocial barriers seems to act as deterrents, impeding managers from fully embracing AI-assisted decisions.

2. Psychological Factors

Personal Well Being and Personal Development Concerns: In a research study, Cao et al. in 2021 focused on the impact of personal concerns, specifically those related to Personal Well-being and Personal Development, on attitudes and behavioral intentions towards the adoption of AI. The concept of Personal Well-being concern pertains to an individual's apprehension about the potential increase in personal anxiety and stress arising from the utilization of AI technology. This aspect finds resonance in the works of Agogo and Hess (2018) as well as Brougham and Haar (2018). Furthermore, the notion of Personal Development concern pertains to an individual's worry about the extent to which AI might impede their capacity for learning from personal experiences. This concern can be linked to research by Duan et al. (1995) and Edwards et al. (2000). The study's findings underscore that these personal concerns can provoke adverse effects on managers' attitudes and intentions towards embracing AI technology. This discovery contributes significantly to our comprehension of the affective dimension inherent in human-technology interactions, emphasizing the importance of considering the potential impact of AI on individuals' personal concerns.

Desire for control and Self-overconfidence: In the third study conducted by Leyer and Schneider in 2021, an in-depth exploration was undertaken to highlight the underlying rationales behind the choices made by managers regarding delegation to AI for strategic managerial decisions. The findings of this study

reveal a spectrum of influential factors driving non-delegation behaviors. First among these factors is the pronounced (over)confidence in human capabilities, constituting a substantial 34.5% of the reported reasons. Additionally, the desire for control emerged as a significant motivator, accounting for 19.9% of the responses.

3. Managers Perceptions of AI

Perceived Threat, Severity and Susceptibility: Cao et al. in 2021 also focused on perceptions. Precisely, they analyzed the dimensions of Perceived Threat, Severity, and Susceptibility and their impact on managers' AI adoption. More specifically, Perceived Threat is considered the extent to which an individual believes that using AI to make decisions is dangerous or harmful (Chen & Zahedi, 2016); Liang & Xue, 2010); Perceived Severity is defined by Chen & Zahedi (2016) and Liang & Xue (2009) as the individual's belief regarding the degree of the negative consequences of using AI to make bad decisions; Perceived Susceptibility, instead, refers to the individual's belief regarding the likelihood that using AI will make bad decisions (Chen & Zahedi, 2016; Liang & Xue, 2009). In accordance with the Technology Threat Avoidance Theory[11] (TTAT) (Liang & Xue, 2009), the study demonstrates that Perceived Threat is positively influenced by managers' Perceived Severity and Susceptibility.

[11] *Technology Threat Avoidance Theory*: asserts that individuals' perceptions regarding their susceptibility to and the resulting severity of technology threats influence their awareness of the threats, which, in turn, influences their motivation and behavior to avoid them (Liang and Xue, 2009).

Moreover, the study's findings go on to reveal that this Perceived Threat exerts a negative influence on both managers' attitude and behavioral intention towards AI adoption. This novel extension of the TTAT framework into the domain of AI adoption emphasizes the importance of accounting for potential risks and threats when contemplating the incorporation of AI in DM processes. Moreover, the study reinforces the empirical evidence for the connection between attitude and intention to use AI solutions, aligning with prior research in the field.

Perceived Adaptability: The investigation conducted by Leyer and Schneider in 2021 shed light on the aspect of Perceived Adaptability in the context of delegating AI for strategic management decisions. A perceptible percentage, in particular 5% of the participants, attributed their choices to the perceived limited adaptability of AI to specific DM contexts. This means that some managers, in the context of organizational decisions, had doubts about the ability of AI technology to adapt and meet the distinctive requirements of various decision scenarios. This recognition offers valuable insights for the development of AI systems tailored to meet the specific demands and contexts of strategic management.

Perceived Value (Value barrier): The study conducted by Mahmud et al. in 2023 has uncovered insights regarding the impact of managers' perceptions linked to the substantial change owing to innovation adoption. For example, perceptions related to usage, value, and risk. Notably, the study reveals that

the influence of these perceptions is not uniform. Unlike what Mahmud et al. (2023) define a Value barrier, which is intricately tied to the perception of performance-to-price ratio in relation to competitors (Laukkanen, 2016; Laukkanen et al., 2007; Molesworth & Suortti, 2002; Ram & Sheth, 1989), the effects of usage and risk barriers do not wield a significant influence on algorithm aversion. This discrepancy in impact suggests a plausible explanation, potentially tied to the specific sample demographics of this study operating within the banking and financial sector. In fact, managers working in this field possess notable educational backgrounds, extensive technological knowledge, and a high degree of familiarity with technology. Additionally, their professional comfort zones inevitably involve dealing with risk-prone environments.

4. Lack of Trust in AI

Unexpectedly, the lack of trust in AI was investigated as a potential barrier only from one study: the third study of Leyer and Schneider (2021). This research delves into the reasons behind delegation to AI or non-delegation, revealing that a significant, yet not predominant proportion, specifically 13.8% of managers, cited the lack of trust in AI as their motivation for choosing non-delegation behaviors. These findings demonstrate that humans react less emotionally to decision outcomes once AI becomes involved, and they tend to be highly insecure about trusting AI, especially in case it has made a mistake. Unlike humans, indeed, who may be forgiven for occasional

mistakes, automated systems are often expected to operate flawlessly every time (Alvarado-Valencia & Barrero, 2014). Consequently, when individuals witness AI making an error, they seem less inclined to continue relying on it, even if, on average, the machine outperforms human capabilities (Dietvorst et al., 2015).

2.2.4 Discussion

This systematic review offers a comprehensive understanding of the facilitators and barriers that influence managers' acceptance of AI systems, specifically in organizational DM. The analysis of findings, from the 8 studies included, reveals that human-AI collaboration is a complex and multifaceted process. Through these studies, we have identified a total of 17 facilitators and 11 barriers, clustered into distinct thematic categories, that play a significant role in shaping attitudes and behaviors of managers towards AI. Key facilitators, as underscored across the studies, encompass organizational aspects, external factors, managers expectancies, XAI design, managers perceptions of AI, user satisfaction, attitudes, behavioral intention, and the interplay of human-primacy in DM. However, these are offset by several barriers such as psychosocial and psychological factors, managers perceptions of AI, and the lack of trust in AI. In essence, this review underscores the need for a holistic approach that encompasses not only technical considerations but also takes into account the intricate interplay of human, social, and

organizational factors, thereby ensuring the successful integration and acceptance of AI-based systems in managerial DM processes.

2.2.5 Design Implications

This investigation has unveiled fundamental implications that can serve as guiding principles for the design of AI-based systems in order to be accepted by managers for organizational DM:

- First of all, organizations should incorporate AI as an advisory and support tool with the prevalence of human power and control to facilitate its integration and acceptance. Indeed, the optimal balance between managers and AI involvement (Haesevoets et al., 2021) suggests that AI systems should complement managerial DM rather than replace it entirely. Therefore, AI solutions should be designed to allow users to maintain a degree of control over decisions while leveraging AI's capabilities. Interfaces should empower users to understand and augment AI-generated recommendations.
- The insight into user perceptions, including ease of use and usefulness, emphasizes the significance of user-centered design. Developers and designers should prioritize the creation of user-centered and user-friendly AI-based systems in order to fulfill the real needs of their prospective users.

- AI solutions should be adaptable across diverse organizational decision contexts. This underscores the importance of modeling human DM and studying the specific context of application before translating it into technology (Suchman, 1987).
- The findings related to XAI design (Gerlach et al., 2022) highlight the importance of creating AI solutions that are trustworthy, reliable, fair and accessible to build trust and alleviate managers' concerns.

Based on these emerging results, we questioned which psychological theory could guide us in approaching the design of these AI-based systems with the perspective of addressing the identified implications while promoting the integration between humans and AI. Below, the theoretical psychological model selected as the foundational framework for this research is introduced.

2.3 A psychological perspective for Human/AI Integration

Since the 80's a growing body of literature on human/machine interaction has produced consolidated evidence on the "external side" of User Experience, that is the front-end layer of interacting with systems. The fast development of AI implementation and emerging findings from the literature review have pushed us to reason on various layers, which focus on the study of contextualized human reasoning models to shape the *"internal side of technologies"*.

In the last twenty years, research on organizational disasters has already demonstrated the risk of taking an ingenuous perspective on technology implementation where technical, rationale, automatic and general was considered as preferable to practical, socialized, and contingent (Heath & Luff, 2000). Additionally, some highlighted the crucial role of proper treatment of information to support organization and individuals avoiding organizational disasters due to mistakes in information management in personal and collective DM processes (Choo, 2008). There is also growing evidence of the relevance of including ecological criteria for designing technologies (Talamo et al., 2011, 2013), to capture the complexity and contingency of real-life actions in specific situations (Talamo et al., 2015).

For this reason, we believe research on Human/AI integration could benefit by taking into account some reflections from Cultural Psychology and more specifically from scholars by AT (Leont'ev, 1974, 1978; Engeström, 1987, 2001) who focus on three central concepts in analyzing the relationship between people and technologies:

- **An asymmetrical interaction between the subject and the object:** AT conceives human activity as a form of doing, performed by a subject and directed to an object, whose outcome will satisfy the needs of the subject. This interaction between the subject and the object is not a symmetrical relationship between two components of a system, since it is initiated and executed by the subject to meet its needs (Pickering, 1993, 1995).

- **Intentionality of human-beings:** Agency, "*the ability to act in the sense of producing effects according to an intention"* (Kaptelinin & Nardi, 2006, p. 33), is another crucial concept, covered by the socio-cognitive theories. For Leontiev, the primary type of agency is that of individual human subjects because it is closely related to the concept of human intentionality (Stetsenko & Arievitch, 2004). According to AT, intentionality is considered as a property of sole individual subjects. As Rose et al. (2005) observed, humans have *''self-awareness, social awareness, interpretation, intentionality, and the attribution of agency to others*'', which are not available to non-living things.
- **Tools' mediation:** Finally, the above-mentioned asymmetrical interaction between the subject and the object can be mediated by a tool, a physical artifact, or an intangible tool (e.g., ideas and procedures), which allows the subject to reach the final goal (Leont'ev, 1974, 1978). The tool, as a mediator of the activity, can facilitate the interaction allowing the subject to achieve the outcome, but it can also limit the interaction from the perspective of that specific tool (Kuutti, 1996). Tool mediation can also support the creation of interobjectivity among team members (Talamo & Pozzi, 2011).

These concepts support the undisputed primacy of humans in the context of human-AI integration, emphasizing the needs identified in our systematic review. Hence, within this theoretical framework, AI can be conceived as a

mediation tool between human subjects and the objects of their actions. Indeed, AI may find application across diverse segments of the DM process, facilitating tasks like information gathering, analysis, criteria standardization, and even automating customer interactions (Haesevoets et al., 2021). However, it's crucial to underscore that AI is fundamentally a tool devised, designed and employed by humans. Therefore, even if AI possesses agency, according to Kaptelinin and Nardi's classification (2006), it detains only a kind of *delegated agency*. In fact, while AI may appear to act upon intentions, it is important to recognize that these intentions are essentially delegated to it by external entities (human beings). As stated by Leont'ev (1974, 1978), the core locus of agency resides within human beings due to their close connection with the concept of intentionality (Stetsenko & Arievitch, 2004). This kind of agency is rooted in *need-based agency* (Kaptelinin & Nardi, 2006), entailing the fulfillment of biological and cultural needs through intention formation and subsequent action.

Based on the analysis of this theory and the findings derived from the review, it is evident how crucial it is to adopt a human-centered perspective for the development of AI-based systems. In fact, investigating and modeling human DM before translating it into technological development guarantees that agency is effectively delegated in accordance with human intentions. Consequently, a thorough examination of human intentions, activities and decision contexts takes on paramount significance. Therefore, in this research

project we prioritize a human-centered viewpoint and a comprehensive understanding of human criteria and preferences to ensure the development of Multi-Actor AI-based systems which are aligned with human internal DM models.

Part 2:

Entering the Research

The research design moved from the following research questions (RQ):

RQ1) Which kind of DM characterizes IHC?

RQ2) Which is the role of AI in MADM?

RQ3) How can AI be accepted by managers in the context of Organizational DM?

RQ4) Which Psychological Theory better contributes to the study of MADM and to the design of AI-based MADSS in the field of IHC?

After collecting initial answers through a thorough literature analysis, we have identified a useful case study to investigate these aspects. The presentation of the real case study will be detailed in the following chapter.

3. AHEDA Case Study: A Multi-Actor AI-based Decision Support System for Organizational Development

Our case study was provided by Mylia, a brand of The Adecco Group specialized in training and development. Specifically, Mylia designs pathways to support people and organizations in their behavioral growth, employing native methodologies and leveraging technology, especially AI, to develop innovative and progressive training models. Our research team, affiliated with the *IDEaCT Social Lab* - in the Department of Social and Developmental Psychology of Sapienza - signed an agreement for scientific collaboration with Mylia (Adecco Formazione) during the early stages of conceptualization of *"AHEDA"*, an AI-based MADSS aimed at identifying targeted development pathways for employees.

The conceptualization of AHEDA as a MADSS emerged after comprehending which were all the actors participating in the DM process, primarily, but not exclusively, related to the identification of development and training paths for employees. In this particular MADM, HR managers bring to the negotiation table the issues closely related to the company's strategy and organizational needs. People managers, directly responsible for the employees, provide more specific information about the employees and their development needs in the workplace context. The employees express their needs and goals and

complete a psychological questionnaire to reveal areas of their organizational behavior, crucial for determining their development path within the organization. Finally, coaches/trainers (as partners of Mylia and on its behalf) gather all this information to identify the best development or training path for the employees. In this MADM, an additional actor comes into play, namely AI, which assists the coach in suggesting potential development paths on the basis of the psychological questionnaire's results. This recommendation will be subject to negotiation among the coach, the coachee, and People and HR managers in the subsequent phases of the service.

The AHEDA psychological questionnaire investigates organizational behavior according to a model of 10 dimensions, which are described below:

1. *Emotional Balance*: Recognizing emotional states and identifying their causes, managing emotions appropriately in different circumstances.
2. *Openness to Risk*: Being open to change and responding proactively to novelty and undefined situations, taking the risk of making innovative decisions not immediately accepted, and exploring new, initially uncertain paths.
3. *Data Driven Mindset*: Considering data and facts examination as essential for one's work, relying on data and statistics to make decisions and define strategies.
4. *Trust*: Having trust in colleagues, superiors, and the organization.

5. *Time Management*: Skill in planning activities and schedules in advance, setting priorities.
6. *Networking*: Building and using networks to develop and share ideas and projects and achieve personal goals, promoting the use of collaborative tools.
7. *Team Building*: Working effectively in groups, welcoming different contributions, mediating between different positions, recognizing conflicts, and focusing on common goals.
8. *Influence*: Being able to influence and inspire others, recognized as a credible reference point by colleagues for credibility, authority, and the ability to lead others through a clear vision of the present and future.
9. *Organizational Identity*: Identifying with the organization's values, purposes, and mission.
10. *Fulfillment*: Finding significant satisfaction and self-realization in one's work, feeling involved and an active part of the company.

Starting from this 10-dimension model, a systematic analysis, based on the *Structural Equation Model* (SEM; Kline, 2016), was conducted. This type of analysis allowed for the evaluation of model goodness-of-fit and linear causal relationships among the dimensions, using various statistical indices. The systematic analysis performed, along with the training method of non-parametric *Bayesian networks*, highlighted additional relationships useful for predictive purposes, ultimately leading to the definition of the probabilistic

AHEDA model. This probabilistic model allows mapping the fulfillment of employees within their organizational context. This calculation model underlying AHEDA has a high predictive power of the relationships between dimensions and allows to research and predict the best development path for each employee.

AHEDA is the result of a multidisciplinary research effort, led by Mylia R&D. The 10-dimensional causal model was elaborated in collaboration with the social psychology research team of the University Cattolica of Sacrocuore, led by Professor Patrizia Catellani. The AI-based system, built to offer recommendations to coaches and trainers in identifying suitable development and training pathways for employee or groups of employees, was developed by the informatic engineering research team University of Pavia, led by Professor Marco Piastra. Simultaneously, the whole service design process was supported by our research team, composed of me and Professor Alessandra Talamo. Precisely, we aligned and integrated the core service concept, previously illustrated, with the insights gained from AHEDA's prospective users, with the aim of supporting not only the Information Architecture design of AHEDA as a technological system, but the entire surrounding service, creating a bridge between the needs of the provider organization, Mylia, and its prospective users.

Fig. 9. *AHEDA Service*

Starting from the general objective of this research project, which is to provide a precise and replicable human-centered methodology for the design of Multi-Actor and User-centered AI-based DSSs, the following specific objectives related to AHEDA case study have been outlined:

- Identify the needs and goals of key actors that can inform the design of the tool in terms of User Experience (coach/trainers, employees, HR managers, People managers).
- Explore the motivations and DM processes of the actors involved in the process in order to create and orchestrate experiences that meet the needs of the clients, users, and other potential stakeholders.
- Investigate the experiential journey of the prospective users.
- Organize the explicit participation of key actors for the service's success from an organizational perspective.

- Model the flow of organizational DM processes leading from service design to service integration with the external market.

In this perspective, it becomes crucial to emphasize the rationale behind the focus of this research activity, directed to the design of the whole service. This emphasis is driven by the understanding that, to address users' needs to generate trust effectively, the technical intricacies of the tool (DSS) itself are not the sole focus of the design process. Rather, the holistic nature of the service surrounding the tool plays a vital role. This is precisely why, beyond the definition of the necessary criteria for AI-based system development, this approach extends to encompass the entire ecosystem surrounding AI and, inevitably, also requires the service provider involvement.

Due to organizational requirements, even though future developments aim to expand the service to training and to the B2C context, the scope of the pilot experimentation has focused solely on the individual development path (coaching) in the B2B scenario. In this perspective, AHEDA service is purchased by organizations for their employees, rather than directly by the service beneficiaries (as in the case of B2C). Therefore, a crucial role is assumed by HR managers, who are responsible for the service procurement decision, even though the direct beneficiaries of the service will be the employees. For this reason, we identified four crucial categories of actors to explore (Fig**. 10**), distinguishing them between:

- *Primary users of AHEDA MADSS*: Coaches (partners of the provider organization) and coachees, identified as the main users of the AI-based platform. The coachee, as the direct beneficiary of the service, and the coach, as the main actor who guides the coachee in using AHEDA service.
- *Secondary users of AHEDA MADSS*: HR and People managers, who, although involved in the crucial MADM process, use the platform for secondary purposes that will be detailed later.

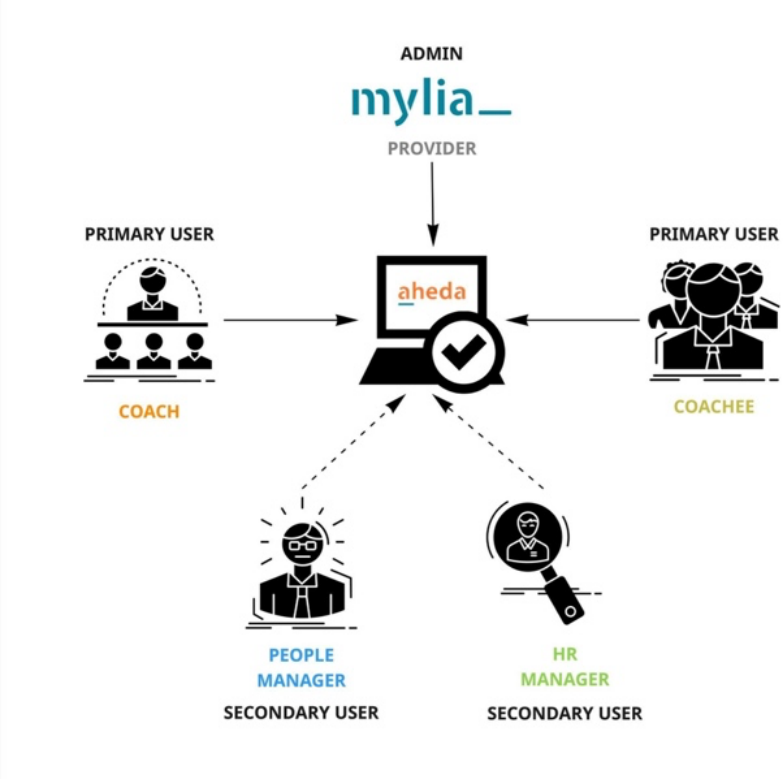


Fig. 10. *Users of AHEDA MADSS*

In addition, we decided to involve in the research components of the *Design & Innovation team* of Mylia, led by Francesca Quintiliani (R&D Coordinator), to gain insights into the provider organization's perspective. Some of these members will also be admin of the AHEDA MADSS.

4. Methodology

To address the research objectives, a specific methodology has been developed, taking into account the reference framework and the significance of a human-centered approach. This methodology unfolds in four main steps - *data collecting, data analysis, data modeling, data bridging* - which are detailed in the subsequent sections of this thesis. This approach draws from the theoretical contributions of AT - as extensively discussed in Part 1 of the thesis - and the methodological principles of Service Design Thinking (SDT).

4.1 The contribution of Service Design Thinking

Design Thinking (DT) is a multidisciplinary approach that involves the use of research, prototyping, and various visualization tools to ideate and orchestrate experiences that meet the objectives of providers with the needs of users, and other stakeholders (Stickdorn & Schneider, 2011).

DT *"is fundamentally an exploratory process"*, as Tim Brown states in his book *"Change by Design"* (Brown, 2009, p. 22). Its iterative approach *"appears to extend the time to get an idea to market, but this is often a shortsighted perception. To the contrary, a team that understands what is happening will not feel bound to take the next logical step along an ultimately unproductive path"* (Brown, 2009, p. 23).

Indeed, DT represents an innovative process that connects the creative approach typical of design with traditional, rational, and logical problem-

solving thinking. This approach is based on real experiences and needs, which manifest in process models led by multidisciplinary teams to create new innovative products, services, and business models. This methodology is not just an engine for innovation but also provides new process models and tools that enhance and visualize every creative process, making it accessible not only to designers but also to multidisciplinary teams and all types of organizations (Tosi, 2018).

DT methodology has been increasingly applied to the field of services, often referred to as SDT. Since the late 1980s, there has been a transition in the corporate landscape, shifting the focus from products to services. Nowadays, the relationship between consumers and companies extends beyond the purchase of a product and includes the services provided. Consequently, competition in this context revolves around a *value-centered design* approach, which aims to align the business objectives of the client with the goals of the user. The former will obtain a return on investment, the latter will obtain a return on experiences. In this perspective, SDT offers the added value of bridging the gap between the objectives of the user and the goals of the organization, which must be compatible with each other. While the service provider aims to deliver a service that is unique, efficient, and effective, the user seeks a service that is desirable, useful, and usable (Moritz, 2005). Consequently, SDT aims to assist service providers in creating innovative

services that effectively *serve* their prospective users so as to grant them a competitive advantage over their rivals.

SDT is characterized by five main principles (Stickdorn & Schneider, 2011):

- *user-centered*: services are tailored to the needs of prospective users;
- *co-creative*: stakeholders are actively involved in the service design process;
- *sequencing*: services activities are designed as interrelated actions;
- *evidencing*: access to the service is implemented through interactive artifacts;
- *holistic*: all activities offered in the service are recognisable as parts of a one sole overall performance.

Thanks to its unique attributes, SDT can play a crucial role in designing a Multi-Actor AI-based system. In particular, it allows to:

- *Increase User Acceptability:* SDT begins with a deep understanding of user needs, desires, and concerns (Curedale, 2016). By empathizing with users, designers can increase user acceptability, creating technological products and services that are useful and easy to use, factors that may promote the intention to use a specific technology (TAM; Davis, 1989). Furthermore, by studying the specific context of application, developers can build AI-based solutions adaptable to the particular decision context (another implication highlighted in the systematic review of Paragraph 2.2).

- *Delegate Agency to AI in accordance with Human Intentions*: in SDT, prospective users and providers are actively involved throughout the design process (Stickdorn & Schneider, 2011). By engaging them as co-creators, designers can ensure that AI-based DSS are built on the basis of their specific DM processes and criteria. This participatory approach guarantees that agency is effectively delegated to AI in accordance with human intentions.
- *Bridge Multiple Actors*: SDT acts as a bridge, connecting actors from different contexts. By embracing a human-centered approach, SDT promotes inclusive DM and the development of innovative solutions that take into consideration the interests of all the actors involved (Marocco & Talamo, 2022).

Therefore, considering all these challenges and opportunities, this research project includes SDT technique as a human-centered methodology to support the design of AHEDA.

4.2 The Research Process

This research process is structured in four primary stages (Marocco et al., 2023a; Marocco et al., 2023b) (**Fig. 11**), which are described more in detail in the following chapters:

- *Data Collecting*: The first stage involves the exploration of the prospective users and the provider organization to gather valuable

data about their psychological and organizational world. This exploration - enabled by the adoption of *User Research* (specifically through narrative interviews) and *Strategic Organizational Counseling* (SOC) - provided the collection of relevant information that served as the basis for the subsequent analysis and modeling activity.

- *Data Analysis*: The second stage represents the analysis of the narrative interviews from *User Research* and the maieutic interviews from *SOC*. This analysis was carried out through the *Thematic Analysis* approach (Braun & Clarke, 2006).
- *Data Modeling:* The third stage represents the modeling of DM processes and activities specific to the prospective users and the provider. This comprehensive modeling approach implies the systematization of data in a selection of SDT tools, such as *Empathy Map* (Bland, 2016), *Personas* (Osterwalder & Pigneur, 2013), *Activity Diagram* (Young, 2008), *Service Ecology Map (*Polaine et al., 2013), *MADM Flow* (Marocco et al., 2023a; Marocco et al., 2023b), *Organizational DM Flow* (Marocco et al., 2023; Marocco et al., 2023a; Marocco et al., 2023b). By doing this, it became possible to gain a holistic view of the different categories of actors involved and develop a solution that addresses their unique needs and challenges.
- *Data Bridging*: The final stage involves bridging the users and the providers not only aligning their respective activities and DM

processes but offering a comprehensive and holistic framework to capture all the specificities - namely their *rules, tools, division of labor, community, objectives, and objects* - that influence each actor's DM process and impacts the creation of interobjectivity. This stage culminates in the creation of the MADM model. This model, considered the principal outcome of this research project, describes the social context in which AHEDA will be implemented, defining the interactions and relationships among the different actors.

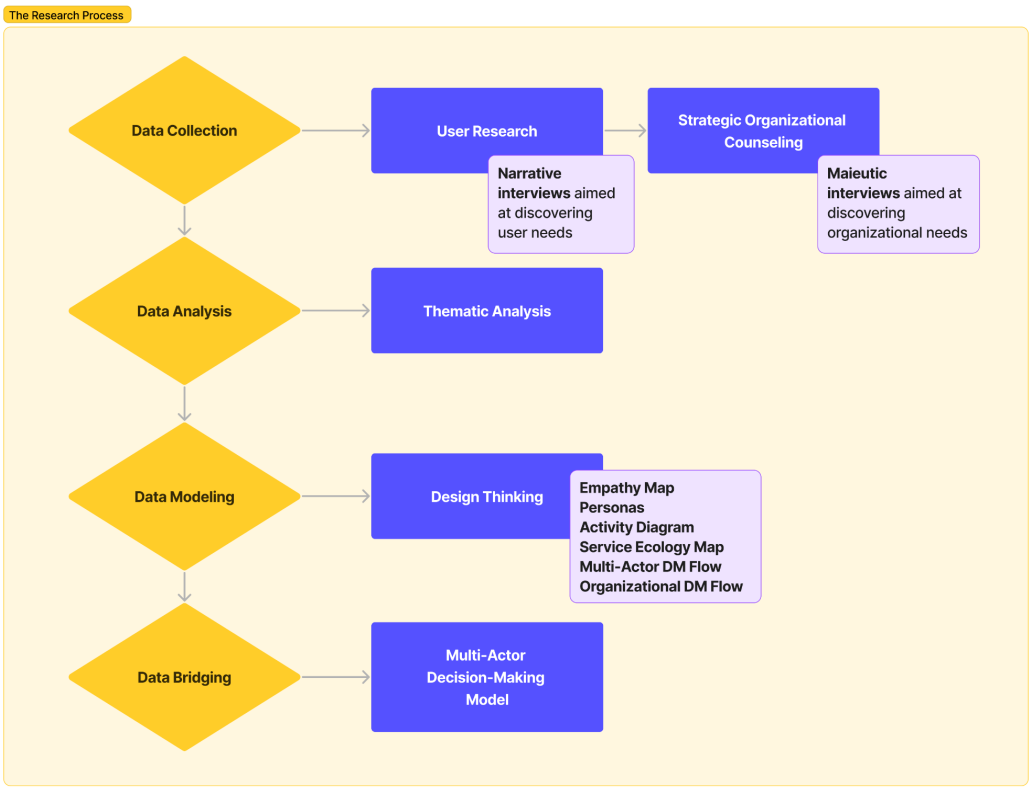


Fig. 11. *The Research Process*

5. Data Collecting

The initial phase employed User Research and SOC. Specifically, our focus was directed towards two distinct levels: internal and external to the provider organization. On one hand, internal organizational needs were explored through a consulting methodology called *Strategic Organizational Counseling* (SOC), to identify the required competencies and key actors to streamline and enhance the AHEDA service delivery process. On the other hand, the specific technique of *User Research* was carried out to understand the specific support requirements of prospective users in order to align AHEDA with their needs and expectations.

5.1 Strategic Organizational Counseling: discovering organizational needs

The first tool we adopted for data collection from the organizational perspective is SOC (Talamo et al., 2021; Marocco et al., 2023; Marocco et al., 2023a; Marocco et al., 2023b). This methodology, developed by *IDEaCT Social Lab* of Sapienza, supports organizations in the delivery of new services, facilitating the organizational processes that are essential for the success of these services (Talamo et al., 2021). It focuses on enhancing awareness on the implicit DM processes that underlie the development of innovative services in all phases of internal management, from ideation to commercialization. SOC allows for a deeper understanding of strategies that support the

effectiveness of service delivery by looking at the different phases as a whole process, where each professional family by the organization plays a role in supporting the innovation delivery. Moreover, SOC uses dialogic sessions and maieutic narrative interview techniques to make different actors within an organization become aware of how organizational structure and processes can be crucial in meeting the demands of potential customers. These sessions are goal-oriented interviews aimed at refining the flow of organizational processes, starting from service design and ending with external market integration. Hence, the intent of SOC is defining a flow of organizational processes - favorable and unfavorable - of each crucial professional family, mapping the way they may interrupt or facilitate the life flow of the service. During SOC, psychologists experienced in organizational counseling help participants elicit representations that guide the service delivery process at the organizational level. When several actors participate in these sessions, alignment of representations by each of them is discussed and modeled together. According to the maieutic method, the participants receive reflective interventions that guide them towards the construction and elicitation of the flow of organizational processes.

In the case of Mylia, it seemed particularly useful to integrate SDT with these sessions, since this work would have allowed to integrate the study of system functionalities to the analysis of the required organizational processes. Therefore, 4 SOC sessions, 3 individual sessions and one group session, were

proposed to Mylia. SOC sessions included three phases based on the following major themes:

Phase 1: *Mapping the professional families involved in the service delivery process and the relationships between them*. At this stage our aim was to identify which professional families needed to be involved and how they interact and communicate at each stage of innovation implementation (from ideation to delivery);

Phase 2: *Identifying specific roles of different professional families and their role-related needs with a focus on the service delivery.* At this stage the aim was to understand the specific tasks of each professional family related to the service delivery process and detect the particular needs and challenges faced to perform their tasks effectively;

Phase 3: *Defining facilitating interventions to promote innovation of practices*. At this stage the aim was to comprehend how specific practices of each professional family should be modified, reshaped or better supported through facilitating interventions to make the whole process more efficient. The result of these sessions was from time to time discussed and reworked by the participants themselves in a visual format that was consolidated in the last meeting. This visual flow shows how the organizational processes, linked to various professional families, need to be governed to ensure the success of the service. The flow diagram, which emerged as an outcome of this process, will be presented as a result in the chapter of *Data Modeling* with the name

Organizational DM flow (p. 98), useful to describe the *rules* of the organizational provider's activity system within the MADM model, or the chronological sequence of actions and decisions of the involved organizational members.

5.2 User Research: discovering user needs

User Research, which typically uses qualitative research methods to explore user needs in-depth, corresponds to the preliminary phase of the SDT process. During User Research, a specific kind of interview, called *narrative interview* (Atkinson, 2002), was employed. Narrative interview constitutes the first means of approaching the user's vision and thought. It is a non-directive, semi-structured interview: *"a conversation initiated by the interviewer, conducted with subjects selected based on an exploratory data collection plan, guided by the interviewer, using a flexible and non-standardized outline"* (Corbetta, 1999, p. 405). Therefore, narrative interviews are characterized by the absence of standardization in both questions and responses, the administration of all questions, and an unpredictable order of administration.

The material that the narrative interview allows to collect is the *Story*, i.e. a short first-person account in which the single individual presents a lived experience concerning a specific theme defined by the researcher. According to Atkinson (2002), *stories* are seen as the preferred form of self-expression, and serve to help participants focus on their assigned and enacted roles within a community and the meaning they attribute to their actions.

Moreover, this approach is characterized by three main aspects (Atkinson, 2002):

1. *The active role of the interviewers*, who, thanks to their expertise in narrative processes, have the opportunity to choose when and how to intervene in support of the narrative.
2. *The duration of the interaction*, which cannot be confined to just an hour, but depends on the narrative of the interviewees.
3. *The definition of the expected material format*, wherein the interviewers explicitly instruct the interviewees to recount episodes from their experience that they consider significant in the context of the research subject.

This method is chosen for its ability to comprehensively understand the opinions and motivations that influence individuals' attitudes and behaviors. It allows for the exploration of intersubjective representations and diverse objectives, while its flexibility enables a multifocal investigation of various interests.

For the User Research, we adopted the *purposeful sampling technique*, widely used in qualitative research for identifying and selecting information-rich cases related to our phenomenon of interest (Patton, 2002; Palinkas et al. 2015).

This involves the identification and selection of individuals or groups who are particularly knowledgeable or experienced in the research field.

There are numerous purposeful sampling strategies (Patton, 2002). For this research project, a form of purposeful sampling was used based on the inclusion criterion in a certain category (*criterion-i*). In particular, *criterion-i* was related to the role of participants and their agency in the working environment. More specifically, we chose the following categories to understand the specificities of all the potential users' categories of AHEDA:

- HR managers;
- People managers;
- Coaches;
- Coachees/training participants;

who have undertaken at least one experience with development and/or training programs.

This strategy was combined with a snowball sampling technique, in which recruited participants were asked to identify other cases of interest among people they know who generally have similar characteristics and who, in turn, also know people with similar characteristics.

On the basis of this sampling criterion, we recruited 16 participants, divided as follows into the four identified categories, selected as crucial within the AHEDA MADM:

- 4 coaches;
- 4 coachees/training participants;
- 4 HR managers;
- 4 People managers.

The categories and numbers of the recruited participants for User Research are shown also in the following table (**Tab.4**).

Participants		**N**
Target	*Coaches*	4
	Coachees/Training Participants	4
	HR managers	4
	People managers	4
Total		**16**

Tab. 4. *Recruited participants for User Research*

We specifically considered participants who also consented to participate in the study and signed the informed consent and provided consent for data treatment.

These sixteen interviews were conducted remotely via Google Meet platform from March 2022 to June 2022. The interviews were divided equally for each target involved: coaches (4), coachees/training participants (4), HR managers (4), People managers (4). The participants' data has also been anonymized

through the creation of unique codes, which are listed in the appendix of this thesis.

All the interviews, which lasted about one hour and a half, were video-recorded to allow for their subsequent transcription, which was necessary for the following phases of data collection and qualitative analysis. The identification of key themes and the construction of interview scripts were carried out following the initial brief, although the first interviews served as guidelines for the finalization of the scripts. In the table below (**Tab. 5**) the list of topics covered for each thematic area of the interview are shown (some variations have been adapted according to the target involved).

MACRO-AREAS	QUESTION TOPICS
Person, rules and work tools	• Main activities • Tools (advantages and disadvantages) • Community • Rules • Motivations
Identification of development needs	• Role in DM • Information to collect • Awareness • Motivation • Tools
Participant engagement	• Awareness raising • Modality • Role
Path negotiation	• Role in DM • Participation • Needs • Information to share
Path design	• Path selection criteria • Role in DM • Participation
Alignment and Monitoring	• Alignment modality • Tools • Information to receive
Output measurement	• Measurement modality • Participation • Request for feedback • Tools
Attitude towards Artificial Intelligence	• Experience • Competence • Trust • Openness to use

Tab. 5. *Interview topics*

These interview topics have been selected to investigate the specific aspects of the development and training process experienced within the organizational context, from anticipatory activities to the actual path, and post-path, in order to understand how to renounce the service. These areas have been explored with the aim of comprehending both the detailed activities carried out by prospective users and the aspects of their psychological functioning. This attention is directed toward the creation of DT tools, which in turn will be valuable for building the final MADM model.

6. Data Analysis

6.1 Thematic Analysis for Design Thinking

In the second stage, interviews have been analyzed and encoded using a *DT tool-oriented coding criteria* based on the *Thematic Analysis* approach by Braun and Clarke (2006). This indicates that the criteria identified as guidelines for the *Thematic Analysis* were aimed at creating specific DT tools, particularly the development of the Empathy Map (Bland, 2016) and the Activity Diagram (Young, 2008). The coding process has been supported by the use of MAXQDA software, which, in particular, has optimized the organization and systematization of data and codes within a single repository.

Among various qualitative methodological approaches, including *Grounded Theory* (Glaser & Strauss, 1967) or *Discourse Analysis* (Wood & Kroger, 2000), we opted for *Thematic Analysis* since our interest was directed to explore key themes established before data collection, used for the construction of semi-structured narrative interviews. Unlike *Grounded Theory*, directed to discovery theories from data, hence characterized by a bottom-up methodology; our approach is hybrid, integrating both data-driven and theory-driven aspects. On one hand, the theory-driven facet is motivated by our *DT tool-oriented* perspective, aimed at investigating specific areas of users' behavior that complement the identified DT tools, within predetermined interview themes. On the other hand, the data-driven aspect arises from the openness' approach

to discover themes that spontaneously emerge during the data collection process. Moreover, unlike *Discourse Analysis*, which focuses on the discourse itself, the concern of Thematic Analysis is with what the discourse reveals - about experiences, rules, activities and so on (Wood & Kroger, 2000), fundamental insights for User Research.

Therefore, *Thematic Analysis* is a qualitative method that involves identifying and analyzing recurring themes within a specific dataset. A theme embodies something significant about the data concerning the study's objectives. It represents a discernible pattern, which could pertain to a specific subject or characteristic discovered within the dataset, regarded as significant, pertinent, and even unforeseen concerning the study's objectives. The identified themes may encompass a diverse array of elements, including behaviors, user groups, occurrences, locations, or circumstances in which these events transpire, among others. Each category of these themes may hold relevance in the context of the study's objectives (Preece et a., 2002). As introduced before, we adapted *Thematic Analysis* in the context of DT using a mixed approach that incorporates both deductive and inductive modes, guided by theoretical frameworks and the emergence of spontaneous data. The following steps of Braun and Clarke (2006) were involved:

1. *Data collection*: relevant data were collected through narrative interviews for User Research.
2. *Transcription*: the collected data were transcribed into textual format.

3. *Familiarization with the data*: a general understanding of the data content was gained.
4. *Generation of categories* **(Fig. 12)**: main themes were identified using a theory-driven approach, referring to users' psychological functioning areas identified by Bland (2016) for creating the Empathy Map (*do, think, say, feel, hear, see, gain, pain;* see p. 109). Sub-themes were developed through a data-driven approach, capturing the main stages of the development path. These sub-themes were used for creating the structure of the Activity Diagram (Young, 2008).
5. *Coding*: different parts of the data were assigned to the identified categories.
6. *Revision and refinement*: categories were reviewed to ensure accurate representation of the data.
7. *Themes analysis*: the identified themes and sub-themes were analyzed for integration into subsequent SDT tools, such as the Empathy Map and the Activity Diagram.

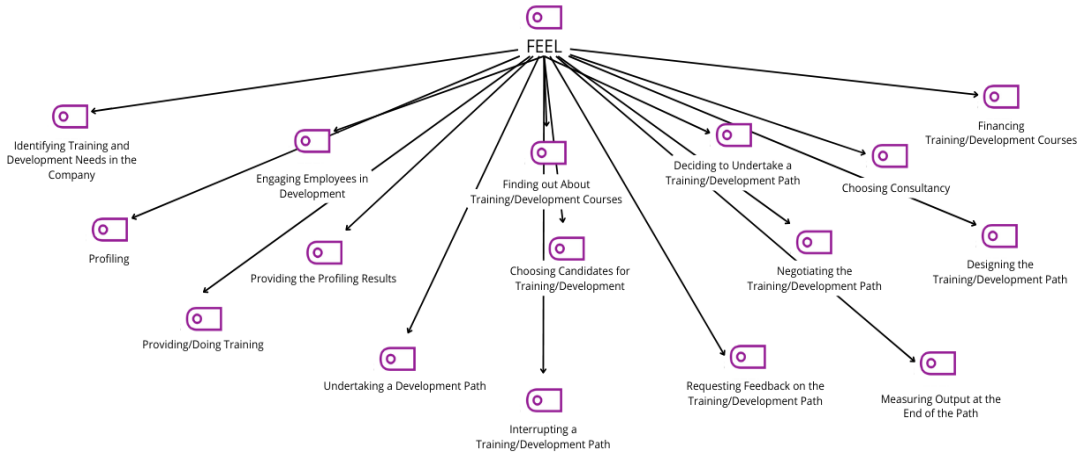


Fig. 12. *An example of generated category for "Feel" (area of Empathy Map)*

This hybrid approach aimed to identify how different target groups positioned themselves in relation to various areas of their psychological functioning regarding relevant themes of the development path. According to us, the innovation of this procedure lies in our targeted application to the creation of DT tools. Indeed, this approach is commonly employed to create the Activity Diagram, aimed at structuring individual ideas and insights into a hierarchical framework that elucidates patterns and themes. In our particular case, we aimed to blend two DT tools, namely the Empathy Map and the Activity Diagram, with the objective of enriching our analysis. In this way, we provided a deeper layer of understanding, specifically in terms of how certain stages of the process, identified as *activities* within the Activity Diagram (see the subsequent paragraph), were perceived in a specific area of users' psychological functioning. For instance, showing that the activity of

"*identifying developmental needs*" was the most abundant in "pains", indicates its significance as a critical juncture of the process (**Fig. 13**).

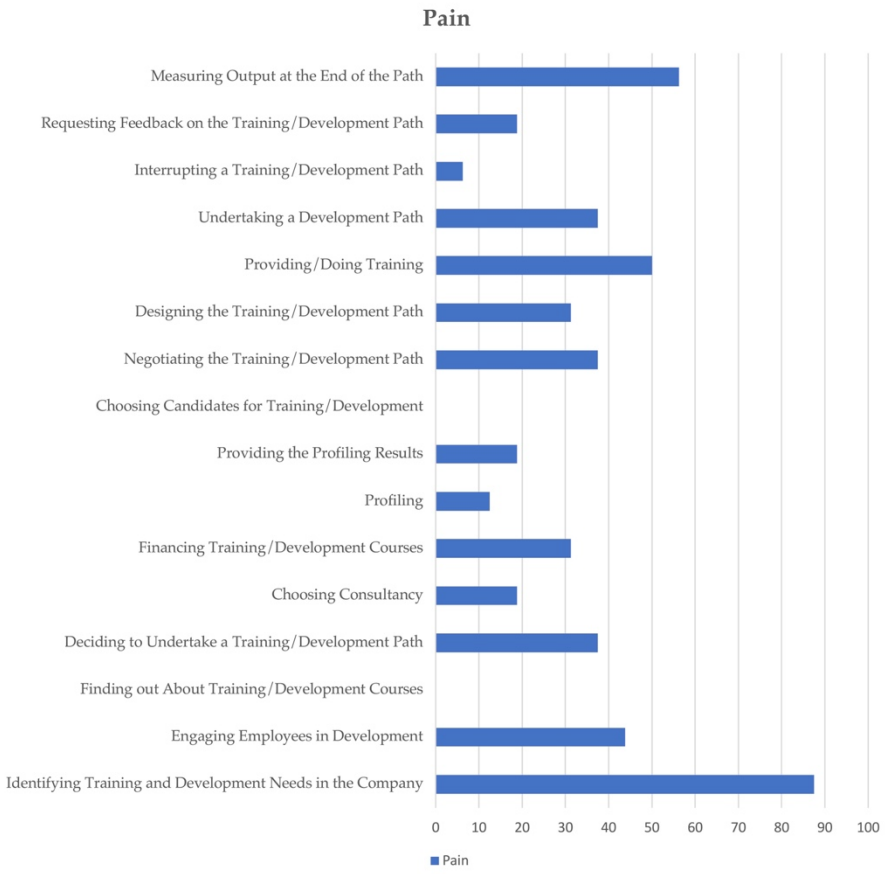


Fig. 13. *Percentage of "Pain" among sub-themes*

Consequently, under themes and sub-themes, a wealth of information can be found. Some elements, such as activities, beliefs, and life philosophies, will converge with the Activity Diagram. Meanwhile, aspects tied to areas of psychological functioning (Bland, 2016) will find their place within the Empathy Map.

Below, we present, as an example, an excerpt from the thematic analysis conducted on the theme of *"Pain"*, which focuses on the barriers and obstacles perceived by the target group regarding a specific sub-theme, namely the identification of development needs. **Table 6** provides selected excerpts from the several target group's interviews.

Tab. 6. *Excerpt from the Thematic Analysis*

PAIN	PEOPLE MANAGER (N=4)	HR MANAGER (N=4)	COACHEE/TRAINING PARTICPANTS (N=4)	COACH (N=4)
Identifying development needs	*In these cases, subjectivity is often one of the biggest risks, especially when it comes to resources and an organization where individuals are influenced by their own perspectives. (CC_RE_1)*	*It's clear that there are certain things that, as an HR professional, don't sit well with me in the sense that I don't see their usefulness, or they need to be diversified. For example, when someone tells me, "I need to take a public speaking course," I might suggest to the manager, "Perhaps let's have them take a communication course first, and then move on to public speaking. Let's provide them with a comprehensive learning journey instead of just a quick fix with a 4-hour public speaking session. (GE_HR_2)*	*Very often, there is a lack of understanding of each other's needs because there are mutual expectations that then turn into demands when the misunderstanding persists over time. (LL_CE_1)*	*I believe that sometimes there is a lack of clear awareness, not only on the part of HR but also from hierarchical managers, of the real development needs of individuals and even less of the most appropriate tools to address them. (SC_CO_1)*
	So, it's not so much about obstacles, but rather the need to allocate structured time to do this. It's not immediate, especially because there is a lot of pressure on other activities. (AL_RE_4)	*However, I would also like these development paths to not always be focused on high potentials. I often receive requests to work with high potentials. Yes, that's fine, but I always believe that if someone is a high potential, they will find their own path without needing anyone's assistance. And if they can't find it here, they will find it somewhere else. (GE_HR_2)*	*So, let me tell you, it was really evident, you know, the underlying approach that we discussed. But again, it's better not to understand what I mean than for you to say, "Look, there's this course, period. Why? Because I decided so." I prefer understanding that what I'm saying is an opportunity, and I'll take it, you know? And certainly, in some way, it will be useful in your professional life, but don't convey a purely formal message because, in my opinion, it's a bit like that. (TT_CE_3)*	*When the coachee is off track, it's because there hasn't been a proper diagnosis of their needs and a correct selection of tools and processes to meet those needs. That being said, it happens more frequently than desired. (SC_CO_1)*
	It also requires a certain level of commitment because it's a space that needs to be carved out among many other priorities. It's not wasted space, of course, but you still have to make room for it amidst everything else. (AL_RE_4)	*Now, I have to tell you that the biggest challenge is the time commitment. Because of the technical nature of the process, you input the data, the system generates results, then there's a meeting, and finally, the outcome of that meeting comes to me. So, there's a significant amount of time that needs to be invested. When I try to convince managers and people that it's time well spent, it can be challenging. However, between you and me, as professionals in the field, we have to admit that we ask a lot from people because ultimately, they are the architects of their own development. (MT_HR_4)*	*Because the more the person realizes and understands the objectives of the training they undertake, the more effective it becomes. The more top-down it is, the more it serves no purpose. (TT_CE_3)*	*I definitely think that helping HR and managers better understand the needs is important. We discussed this in relation to coaching, but it applies even more to gathering training needs because the tendency to send random people to training sessions is very common and widespread. (SC_CO_1)*
				The problem lies in asking the right open-ended question. Because an open-ended question could be useless or simply lead the person to express a judgment about themselves that is not helpful. (AP_CO_3)

7. Data Modeling

As previously explained, the *Thematic Analysis* of the interviews allowed us to proceed with the modeling phase. In this stage we included a category of SDT tools that enabled the systematic organization of data collected through SOC and User Research for the presentation of the results. From the provider's perspective, we used a visual tool, the *Organizational DM flow*. From the users' perspective, we employed typical SDT tools such as *Empathy Map, Personas, Activity Diagram,* and *Service Ecology Map*. Furthermore, we adapted the *User Journey*[12] to suit the contextual use of this project, resulting in the creation of a *MADM flow*. Each of these tools will be described in detail in the following paragraphs, outlining their functionalities, scope, the emerging results, and design implications.

7.1 Organizational perspective

7.1.1 Organizational DM Flow

7.1.1.1 Research Tool Description

The Organizational DM flow emerged as the outcome of SOC sessions. It shows how the DM processes, linked to various professional families and actors of the provider organization, need to be governed to ensure the success

[12] *User Journey*: a tool that provides a vivid, concise, structured, and timely visualization of the User Experience of a service (Stickdorn & Schneider, 2011).

of the service. The further added value of this flowchart is that it allowed to raise the attention of the provider organization on the facilitation interventions to be promoted within the company, to ensure that behaviors conducive to the success of the service are encouraged as much as possible.

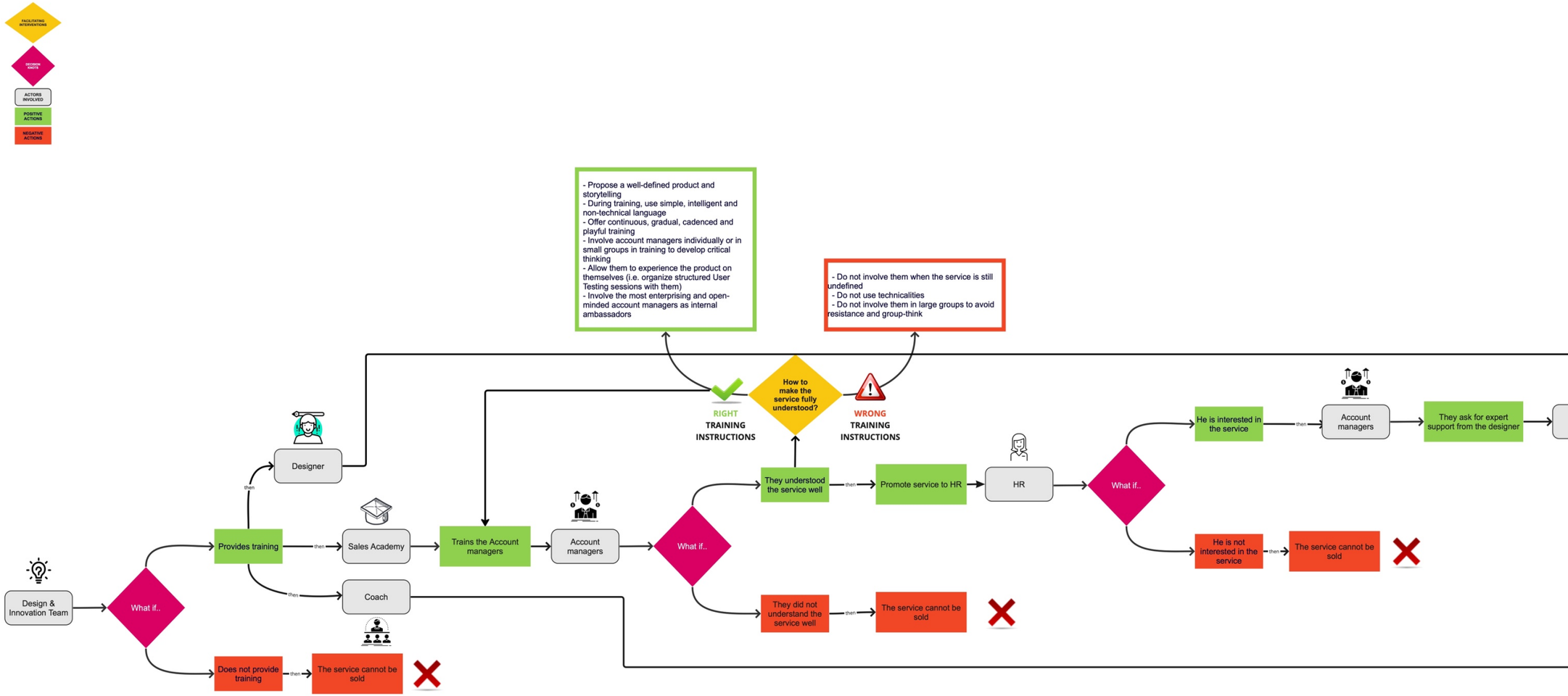
7.1.1.2 Results and Organizational Implications

Below is shown the entire Organizational DM flow of AHEDA, represented in its visual format (**Fig. 14**).

Some *decision knots* emerged from the SOC sessions related to the professional families identified in the flow; each of these decisions is connected to what happened before and enables what happens afterward. These points are highlighted in the diagram as *fuchsia diamonds* and stand for *"what if"* questions. From there two possible paths branch off:

- a positive one, colored in green, in which a favorable behavior or decision of the professional family is made explicit which allows it to continue with the life flow of the service;
- a negative one, highlighted in red, in which an unfavorable professional family's behavior or decision interrupts the flow of the service, thus requiring particular attention to understand which facilitative interventions within the organization can avoid encountering such obstacles.

This methodology, through the use of maieutic interviews and the definition of a structured visual path, aimed to raise providers' awareness on its organizational needs for the successful integration of AHEDA with the external market.


FACILITATING INTERVENTIONS
DECISION KNOTS
ACTORS INVOLVED
POSITIVE ACTIONS
NEGATIVE ACTIONS
- Propose a well-defined product and storytelling
- During training, use simple, intelligent and non-technical language
- Offer continuous, gradual, cadenced and playful training
- Involve account managers individually or in small groups in training to develop critical thinking
- Allow them to experience the product on themselves (i.e. organize structured User Testing sessions with them)
- Involve the most enterprising and open-minded account managers as internal ambassadors
- Do not involve them when the service is still undefined
- Do not use technicalities
- Do not involve them in large groups to avoid resistance and group-think
How to make the service fully understood?
RIGHT TRAINING INSTRUCTIONS
WRONG TRAINING INSTRUCTIONS
Design & Innovation Team
What if..
Provides training
Designer
Sales Academy
Coach
Does not provide training
The service cannot be sold
Trains the Account managers
Account managers
What if..
They understood the service well
Promote service to HR
HR
What if..
He is interested in the service
Account managers
They ask for expert support from the designer
He is not interested in the service
The service cannot be sold
They did not understand the service well
The service cannot be sold
then

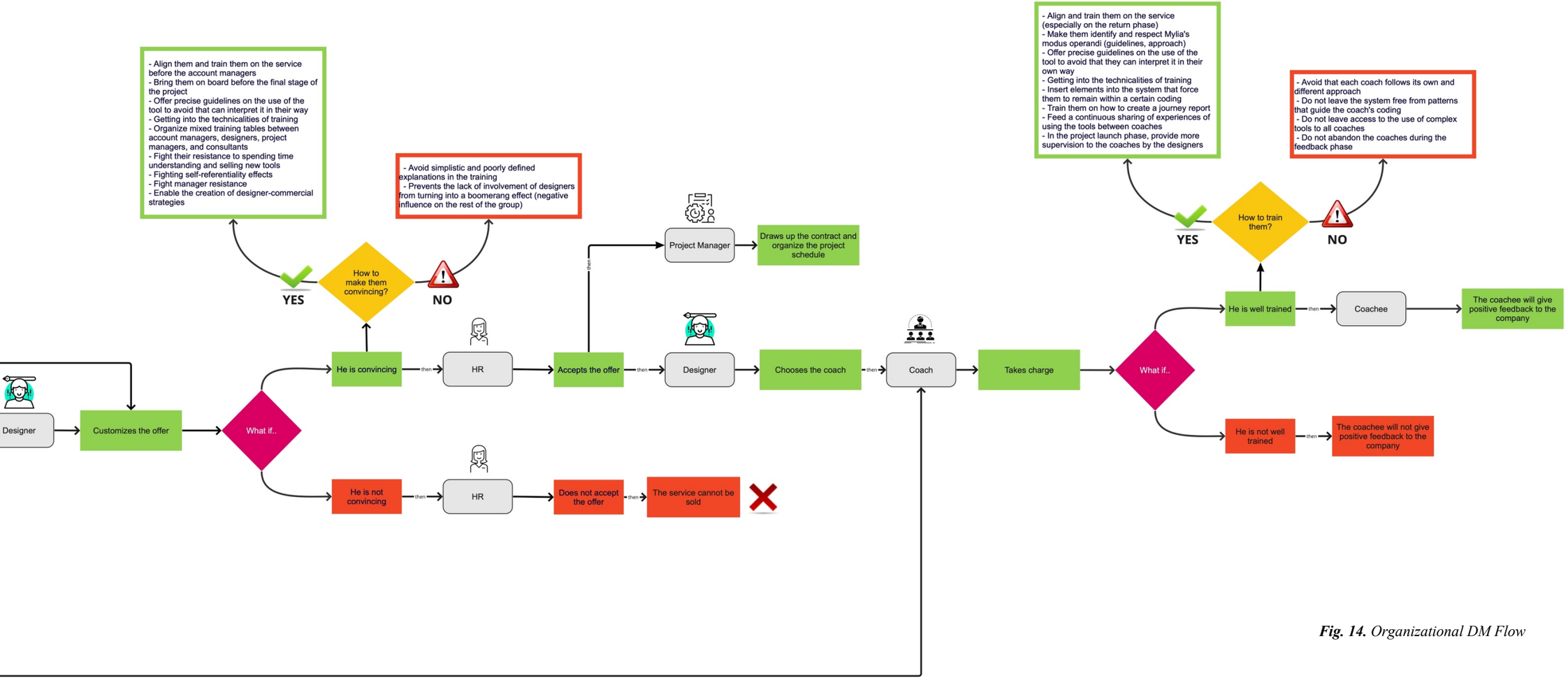


Fig. 14. *Organizational DM Flow*

From the SOC sessions we have identified four main categories of professional families - *account managers* (service sales personnel), *designers* (in charge of customizing the service), *project managers* and *coaches* (freelancers with whom Mylia establishes a partnership agreement to carry out the service) - to be involved and trained for the promotion of the service. The primary organizational needs were associated with the professional roles of *account managers*, *designers*, and *coaches*. For these categories of actors, we identified facilitating interventions aimed at optimizing and streamlining the service delivery workflow (**Tab. 7**).

PROFESSIONAL FAMILY	PRINCIPAL ORGANIZATIONAL NEEDS	FACILITATING INTERVENTIONS
Account managers	- Enable them to effectively communicate and sell a complex technological service, even without possessing technical expertise.	- Involve account managers in training before the final stage of the project - Offer gradual and cadenced training - Use simple and non-technical language in training - Engage account managers individually or in small groups - Allow them to test the product on themself - Support the account managers in creating a storytelling for the sale of the product
Designers	- Enable them to acquire product knowledge and technical expertise to enhance their persuasiveness during the sales and customization phase. - Make them feel part of the project.	- Align and train designers on service at an earlier stage than salespeople - Use technical and specific language in training - Give designers more opportunities to express themselves and participate in the project - Involve the designers in the User Testing of the prototype - Offer precise guidelines on the use of the tool
Coaches	- Align their work approach with that of Mylia to ensure consistency and efficiency.	- Enable only the most expert coaches to use the tool, therefore make training more selective - Use technical and specific language in training - Offer precise guidelines on the use of the tool - Encourage an initial supervision of the coaches by the designers - Train the coaches on the creation of a structured report at the end of the development path

Tab. 7. *Principal organizational needs and facilitating interventions emerged from SOC*

Account managers:

- *Principal Organizational Need*: to enable account managers to effectively communicate and sell a complex technological service, even without possessing technical expertise.
- *Facilitating Interventions*: to solve this organizational need, it was recommended to involve account managers in training sessions before the final stage of the project in order to provide clarity in the proposal. It was suggested to provide gradual and cadenced training, using simple and non-technical language to ensure progressive, continuous, and understandable learning. Furthermore, engaging account managers individually or in small groups was advised to foster critical thinking and avoid group think. Additionally, it was recommended to support account managers in creating a storytelling approach for the product's sale to make their pitches more compelling.

Designers:

- *Principal Organizational Needs*: enabling designers to acquire product knowledge and technical expertise to enhance their persuasiveness during the sales and customization phase; making them feel valuable participants in the project.
- *Facilitating Interventions*: to solve these organizational needs, it was recommended to align their training with the service at an earlier stage

compared to account managers, as they possess greater expertise and delve deeper into the details of the service. It was suggested to employ technical and specific language during the training sessions, offering precise guidelines on tool usage to enhance their effectiveness and provide designers with the necessary expertise. Moreover, it was recommended to offer more opportunities for designers to express themselves and actively participate in the project, including involvement in user testing of the prototype.

Coaches:

- *Principal Organizational Need*: aligning coaches' work approach with that of Mylia to ensure consistency and efficiency during the service.
- *Facilitating Interventions*: to respond to this organizational need, it was recommended to adopt a more selective approach, allowing only the most experienced coaches to utilize the tool. It was advised to employ technical and specific language and provide clear guidelines on tool usage, in addition to an initial supervision of coaches' service usage by Mylia designers. Additionally, it was suggested to train coaches on creating structured reports at the end of the development process, in order to enable systematic evaluation of outcomes in relation to multi-actor metrics.

7.2 Users' perspective

7.2.1 Empathy Map

7.2.1.1 Research Tool Description

As for the users' perspective, we began our modeling process from the Empathy Map. The Empathy Map is a visual tool commonly used in the SDT process. It helps to design products, services or business models based on the customer's perspective, as well as analyzing every single component of the user's psychological functioning. According to Bratsberg (2012), the aim of the tool is to create a certain degree of empathy with a person or a group of people (Gray et al., 2010), in order to obtain an overview of the user (Personas) that goes beyond demographic characteristics and develops a deeper understanding of his/her environment, behavior, aspirations and concerns (Osterwalder & Pigneur, 2013). Hence, Empathy Map creates a shared understanding of the users' needs among the design team and provides support for DM (Adikari et al. 2013). In the first version of the Empathy Map, Matthews (2012), proposed to investigate four areas of the users' psychological functioning:

- *See*: it refers to what the user sees and/or notices in the environment around him.
- *Say and Do*: the first contains direct quotes of what the user openly states during a narrative interview, quoted word for word (verbatim); the second contains the actions performed by the user.

- *Think and Feel*: this area is related to what happens in the user's mind. The first captures what he is thinking during the experience; the second is related to the emotional state of the user.
- *Hear*: it refers to how the environment affects the user.

Subsequently, Bland (2016) enriched Empathy Map **(Fig. 15)** to include the areas of *Pain* and *Gain*: the first refers to the frustrations, pitfalls, and risks that the user faces during his experience; the second to what the user really needs and wants to achieve his goals. These areas are fundamental for the definition of the service as, through these, it is possible to derive the unsatisfied needs, the motivations that may push the person to use the service, or the benefits to be offered in order to motivate the user to relaunch the service. Therefore, Bland's version is the most commonly used in the DT process and it is also the version we decided to adopt in this research project.

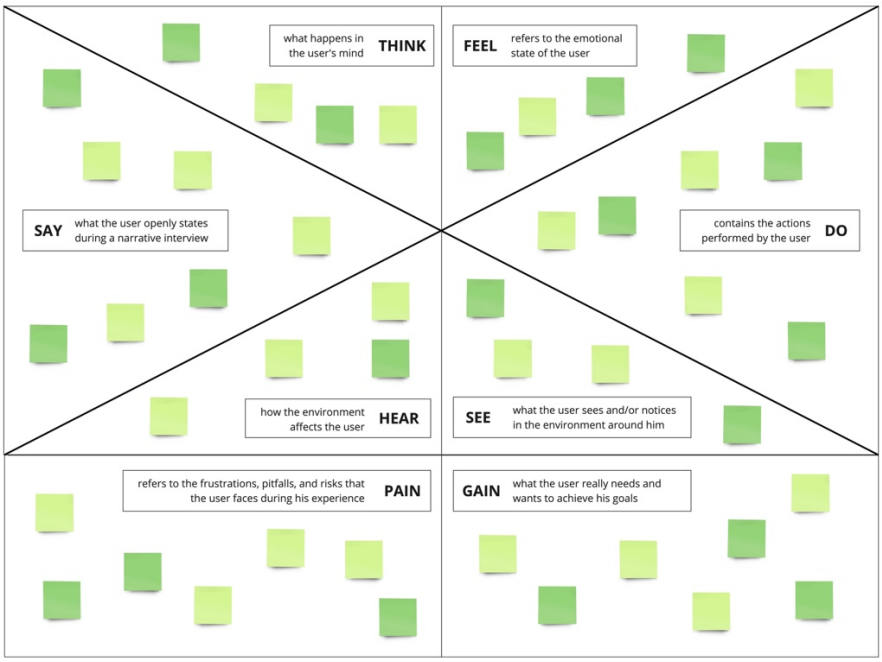


Fig. 15. *Structure of Empathy Map*

7.2.1.2 Results

After the Thematic Analysis of the interviews, four Empathy Maps were created, each specific for a specific target. Due to space constraints and readability concerns, it was not possible to include the entire Empathy Maps in this thesis. However, below, we present the classification of the Empathy Maps based on similarities and contrasts within each map. We have decided to categorize them on the basis of the relational attitudes of target users. To enhance comprehensibility, we have extracted a few post-its for each classification.

- **Empathy Map of coaches**, divided into two sub-targets:
    - *Inclusive coaches (orange color code)*: who present an attitude of inclusiveness in the relationship with stakeholders (**Fig. 16**);
    - *Exclusive coaches (orange color code):* who present an attitude of exclusivity in the relationship with the coachee and resistance in the involvement of other stakeholders (**Fig. 16**).

Fig. 16. *Representative post-its extracted from the Empathy Map of coaches*

- **Empathy Map of coachees/training participants**, divided into two sub-targets:
    - *Motivated coachees (light yellow color code)*: who have carried out coaching courses and who have a good level of motivation for growth (**Fig. 17**);
    - *Enthusiastic training participants (dark yellow color code)*: who appreciate and seek training opportunities (**Fig. 17**).

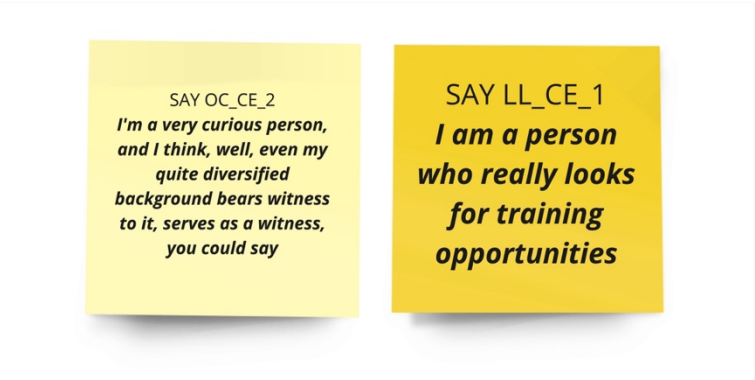


Fig. 17. *Representative post-its extracted from the Empathy Map of coachees*

- **Empathy Map of HR managers**, divided into two sub-targets:
    - *Collaborative HR managers (light green color code)*: who present an attitude of constructive collaboration with respect to the consultants to whom training, and development is delegated (**Fig. 18**);
    - *Disillusioned HR managers (dark green color code)*: who are discouraged by the poor perception of the value of training and development in the corporate culture (**Fig. 18**).

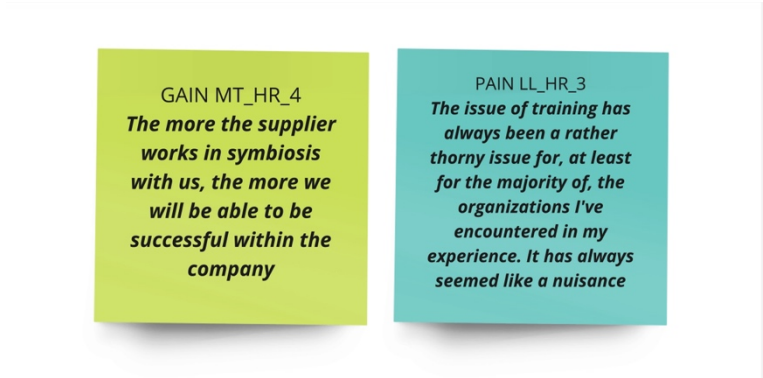


Fig. 18. *Representative post-its extracted from the Empathy Map of HR managers*

- **Empathy Map of People managers**, belonging to a single target:
    - *Vigilant people managers (blue color code)*: who have an attitude of vigilance and control with respect to those who are delegated for training and development (**Fig. 19**).

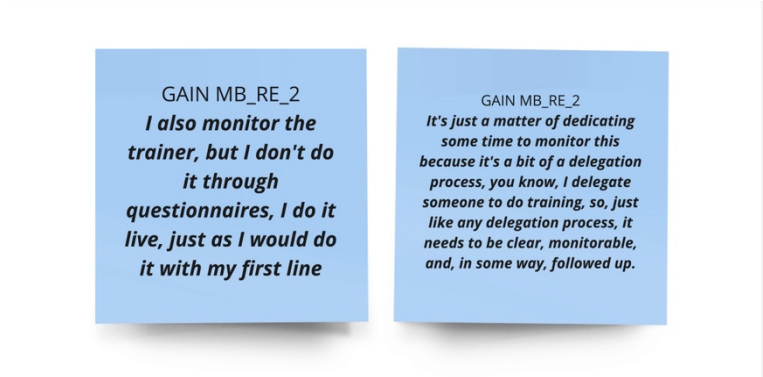


Fig. 19. *Representative post-its extracted from the Empathy Map of People managers*

7.2.2 Personas

7.2.2.1 Research Tool Description

Once systematized data within the Empathy Maps, we created Personas (**Fig. 20**), i.e. archetypes of real people (Osterwalder & Pigneur, 2013), through

which we explored different target's spheres of interest, such as goals, abilities, activities, motivations, needs, and obstacles. There are various ways and formats to represent Personas, but normally a Personas is created for each type of user through a combination of images and text. The strengths of this tool lie in its data driven approach and in its actionable knowledge: in fact, although the proposed characters are fictitious, the motivations and reactions are real, as they are inferred from the data obtained through narrative interviews. In the SDT process, Personas are built through multiple sections, each deriving from a specific area of the Empathy Map (Stickdorn & Schneider, 2011):

- Goals from Gain;
- Activities from Do;
- Questions from Say & Pain;
- Motivation from Think & Feel;
- Obstacles from Pain;
- Profile from a summary of all collected data.

The aim of this tool is to define the desires, objectives, activities and needs of a typical target so that they can be transformed into the functionalities of the service.

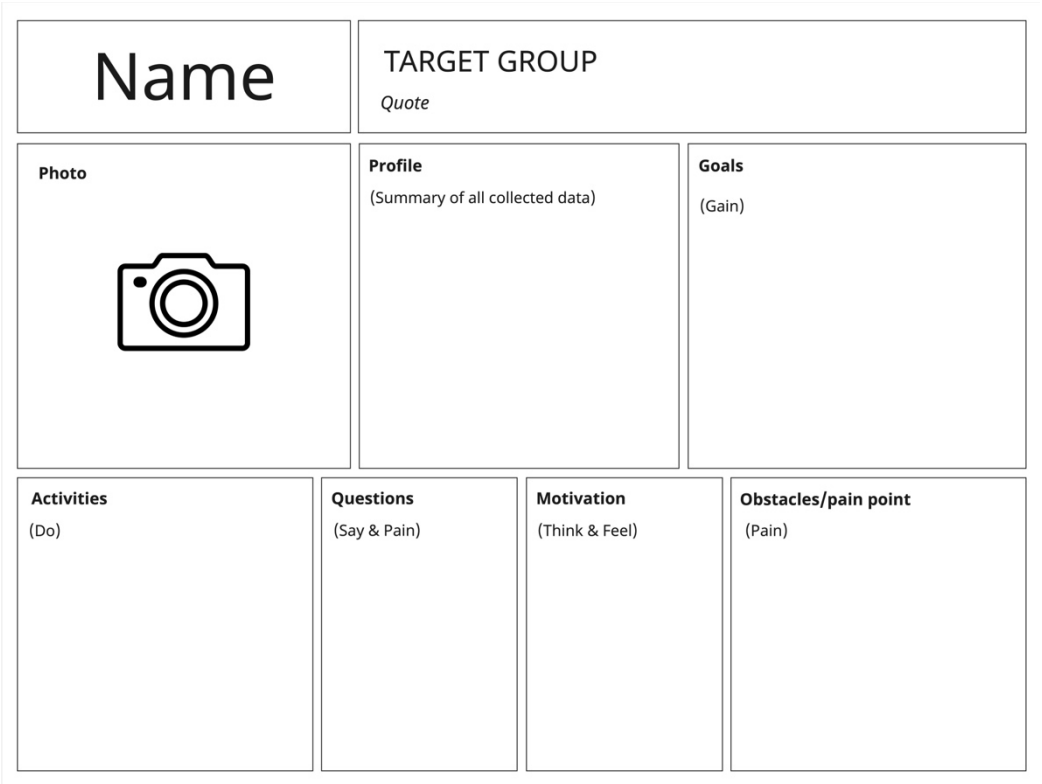


Fig. 20. *Structure of Personas*

7.2.2.2 Results and Design Implications

From the data extracted from the Empathy Maps and through the identification of sub-targets, we profiled 8 Personas.

Starting from the Empathy Map of Coaches, we developed two profiles of 1st level Personas and one of 2nd level Personas:

- **Samuel**: the Inclusive Coach (**Fig. 21**);
- **Andrew**: the Exclusive Coach (**Fig. 22**);
- **George**: the Unmotivated Coachee, which did not emerge from the data collected directly from the coachees, but from indirect data coming from the coaches (**Fig. 23**).

From the Empathy Map of Coachees/Training Participants, we identified the profiles of two Personas:

- **Christine**: the Motivated Coachee (**Fig. 24**);
- **Rachel**: the Enthusiastic Training Participant (**Fig. 25**).

Starting from the Empathy Map of HR managers, we defined two Personas:

- **Rose**: the Collaborative HR (**Fig. 26**);
- **Philip**: the Disillusioned HR (**Fig. 27**).

In the end, from the Empathy Map of People managers, we profiled a unique Persona:

- **Carl**: the Vigilant Manager (**Fig. 28**).

The 8 Personas are visually represented below in their entire description, distinguished by the specific color code of their sub-target. For each Personas we explored and described the areas of activities, goals, barriers, questions, personal motivations, tools, and attitude towards artificial intelligence.

SAMUEL

THE INCLUSIVE COACH

"The more everyone is on board, the more the person's work makes sense, given that it is work that takes place within a system of relationships"

Profile

Samuel is a free-lance coach and trainer who lives in a big city. After having worked as a company employee for several years, today Samuel collaborates with various companies that provide training and development interventions for third parties. Therefore, when he is hired he is confronted with a complex system of relationships which he has come to recognize as important. Samuel, in fact, pays close attention to the involvement of the company client as he believes it is fundamental for the growth of the resource and for the success of his intervention. However, he often finds himself complaining about some recurring problems, such as the lack of awareness of the coaching tool and the poor ability of managers to involve and motivate resources before such a path. In an initial phase, Samuel carries out a context analysis through an initial exploratory survey, sometimes supported by assessment tools. Through a moment of restitution, Samuel co-builds a shared diagnosis together with the person and, following a negotiation, identifies the most suitable development path, starting a professional relationship with the person where trust and confidentiality become the keywords. His biggest gripe? The impossibility of autonomously deciding the duration of the course due to the financial constraints to which the company is subjected. A wish of him? Being able to identify metrics for the evaluation of the intervention in order to enhance and objectify its work in the eyes of the client.

Objectives

- Building a trusting relationship with the coachee
- Involve all stakeholders during the process
- Make participants and stakeholders more aware of the coaching tool
- Have support tools that help make the initial needs more objective
- Receive support in interpreting assessment tools for returning the profile to the coachee
- Return the assessment results in a dialogical way
- Valuing the coachee's resources rather than highlighting gaps
- Thoroughly inform the coachee about the areas of investigation of the assessment test and the time that she will have to dedicate to it
- Investigate indicators of the person's development potential such as: information regarding the current role, years of work, horizontal or vertical mobility in the organization, variety of sectors in which he has worked; extracurricular experiences; interests; characteristics in which the person is not recognized
- Identify KPIs for measuring the results of the coaching process
- Measure the effect of the intervention approximately six months later

Activities

- He has participated in training courses to become a coach
- He works as a freelance trainer and coach
- He organizes meetings with the client (HR, People manager) to understand the need for professional development
- He makes a context analysis with respect to the role and the person
- He evaluates any obstacles and critical issues along the way
- He uses assessment tools on which he has been trained
- He returns the profile to the person
- He tries to arrive at a shared diagnosis
- Identifies the most suitable path between individual coaching, team coaching, classroom training
- He respects the confidentiality rule regarding what is said during the coaching sessions
- He collects feedback at the end of each session

Questions

- How can managers be made more aware of the coaching tool?
- How can I motivate the coachees if the corporate clients themselves have not done it?
- How can I make the coachee understand that time spent on coaching is time well invested?
- How can the result of the coaching process be measured more objectively?
- What support would be more effective in learning how to interpret the results of the assessment tools?

Motivations

- Differentiate yourself from the psychologist identity
- Not to be exploited by the client
- Always work in a positive sense
- Make the result of your intervention more objective
- Being able to fully involve the corporate client for the development of the resource
- Receive support for the use of technological tools useful in one's work

Barriers

- Lack of awareness and alignment of stakeholders and participants regarding the coaching tool
- The lack of involvement and exchange of information with the corporate client
- Lack of awareness of resource needs on the part of managers and therefore the absence of a correct diagnosis and choice of development tool
- The difficulty in interpreting technological tools intended for the return of the assessment
- Lack of coachee involvement and difficulty remembering tasks to be performed outside of sessions
- The inability to extend the duration of the course due to funding constraints
- The absence of a post-path evaluation phase
- The difficulty in finding KPIs for measuring post-journey results

Tools for identifying needs

- Qualitative collection (open and deep questions; stimulating and projective questions)
- Assessment tools for cognitive, behavioral and aptitude analysis
- Skills balance sheet

Attitude towards Artificial Intelligence: SKEPTICAL

- *"I think the human factor, in certain circumstances, can still make the difference"*
- *"The human mind is much more, much more, so I would see artificial intelligence not as a replacement but as a complement."*
- *"I have a bit of a prejudice ... everything that is not fully known ... leaves a little uneasiness"*

Fig. 21. Personas Samuel

ANDREW

THE EXCLUSIVE COACH

"Triangulation often increases the failure rate of a coaching process. The simplest form of coaching is the one-on-one approach"

Profile

Andrew has been working as a freelance coach for several years. Currently, a significant portion of the clients they work with are referred by intermediary companies. Andrew's coaching interventions primarily focus on achieving goals, facilitating change, and enhancing communication skills. For Andrew, the primary goal in coaching is the satisfaction of the coachee, even in cases where there may be a misalignment of goals between the coachee and the corporate client. Andrew often encounters challenges related to maintaining boundaries, feeling uncomfortable with the pressures from corporate clients, and the requests for information about the coaching process, which they ethically cannot disclose.
Andrew also frequently observes a lack of preparedness in coachees who come into the coaching process with limited self-awareness and motivation for the required commitment. The interference of the larger system surrounding the individual is something that disturbs Andrew. They believe that triangulation, involving multiple parties, often increases the likelihood of an unsuccessful coaching journey and that it would be more effective to work exclusively with the individual in question.
At times, Andrew has used assessment tools for which they received training and certifications. However, Andrew maintains some skepticism about these tools, especially when they become aware of the biases they can introduce into coaching relationships.

Objectives

- Prioritize coachee satisfaction even when there is misalignment with the client's requests.
- Co-create the meaning of the assessment with the coachee.
- Avoid attributing a psychological connotation to coaching.
- Have the ability to structure an effective coaching journey within approximately 10 sessions.
- Meet the coachee during triangulation after they have undergone a self-awareness process regarding the coaching tool.
- Associate the representation of the assessment with concrete examples related to daily life.
- Be facilitated by the use of artificial intelligence in data analysis during the assessment phase, especially for comparison with the coachee's reference sample.
- Explore indicators of the individual's development potential, such as values, needs, satisfaction level within the company, and engagement level in the development process.
- Utilize a shared workspace with the coachee to provide reminders about tasks to be completed outside of the sessions.

Activities

- Works as a freelance coach
- Conducts interventions (both individual and team) aimed at achieving goals, facilitating change, and improving communication
- Assists individuals in managing relational processes among colleagues and between superiors and subordinates
- Conducts coaching sessions lasting approximately an hour and a half
- Utilizes open-ended questions that guide individuals towards self-awareness and deeper understanding
- Has undergone training courses to obtain certification for the use of specific assessment tools
- Uses the assessment tools for which they have been trained as a starting point
- Utilizes competency assessments as a tool.

Questions

- How can coachees be made more motivated before approaching the coaching journey?
- How could the triangulation process be facilitated?
- What could be some good Key Performance Indicators (KPIs) for measuring the results of the coaching journey?
- How can I make it clear to the supervisors that they should not interfere during the coaching journey?
- How can I best manage the misalignment between the supervisors' requests and the coachee's needs?

Motivations

- Maintain ethics, transparency, and confidentiality as absolute principles throughout the coaching journey.
- Obtain certifications and training in assessment tools to provide a solid foundation for your work.
- Prioritize coachee satisfaction as the primary objective.
- Conclude the triangulation process with alignment among all stakeholders.

Barriers

- The intrusiveness and pressure from the client's representatives during the coaching journey.
- Requests for intermediary meetings with the client that jeopardize the confidentiality of the coaching process.
- The difficulty in maintaining a balanced boundary with the client between sharing information about the progress of the coaching journey and disclosing its content.
- The challenge of selecting the right open-ended questions to begin exploring the coachee's development potential.
- The lack of engagement and commitment from the coachee.
- Pollution in defining needs that may occur during triangulation.
- Misalignment between corporate demands and the coachee's needs.
- The presence of intermediaries during triangulation.
- The possibility that assessment results may introduce biases or prejudices in the coach regarding the coachee's areas of improvement.
- The difficulty in identifying key performance indicators (KPIs) for measuring post-coaching results.

Tools for identifying needs

- Qualitative data collection (open-ended and in-depth questions; stimulus and projective questions)
- Assessment tools for cognitive, behavioral, and attitudinal analysis
- Competency assessment

Attitude towards Artificial Intelligence: OPEN WITH RESERVE

"Artificial intelligence must be absolutely valued and used in the right way, without thinking that it takes things away from us... it's simply a support that allows us to do our tasks better or opens up space for us to focus on other things, first and foremost."
"When empathy, creativity, empathy, and intuition are involved, there cannot be artificial intelligence; there must be a human being."

Fig. 22. Personas Andrew

THE UNMOTIVATED COACHEE
GHOST PERSONAS

GEORGE

Profile

George is 54-year-old and works in a multinational company. George feels that he has already achieved all his career goals and doesn't perceive a strong drive for growth or a need for self-improvement. Nevertheless, the HR department of his company has identified him as a candidate for a coaching program, aiming to invest in high-seniority resources. George feels that the program has been imposed on him, as he was nominated without being involved or consulted. Furthermore, no one has provided him with adequate justifications for his nomination or information regarding the areas of improvement identified for the program. George is unaware of what to expect, as he has never participated in other coaching programs; for this reason, initially, he approaches the coach with a resistant attitude. George also faces significant time constraints due to his numerous work responsibilities.

Fig. 23. *Personas George*

CHRISTINE

THE MOTIVATED COACHEE

"I am a person who really looks for training opportunities"

Profile

Christine works as a legal consultant in a company. She is a very curious and introspective person and in her life she has always looked for opportunities for both professional and personal training and growth. A year ago she received an advertising email from a famous company that deals with training and development and she approached the idea of undertaking a coaching journey to overcome her shyness and improve communication skills her. Christine has chosen to undertake this path independently, self-financing. Thanks to the help of the consultants and also on the basis of her development objectives, she chose the coach with whom to carry out the course. You have carried out self-assessment activities and participated in a short interview with the coach to outline the areas of intervention. During the journey, outside of the sessions, she greatly appreciated the "home exercises" assigned by the coach, finding inspiration from books and films that had been suggested to her. Along the way she kept a "logbook" that helped her keep track of her changes and perceptions of her. Christine complains that her company has not taken care to identify her training needs and has never financed individual development paths, except for high seniority roles. Due to the high economic cost of the coaching process, Christine will not currently be able to carry out further coaching, even if in her heart she would like to explore other aspects of her person.

Objectives

- Grow professionally and as a person
- Undertake coaching courses for the development of one's career
- Being listened to in a more attentive and structured way by one's own company in order to be targeted towards a development path
- Always receive clarity from managers regarding the reason for the training request
- Be supported in setting development goals
- Dealing with a physical (and not artificial) person before being directed towards a specific development path
- Get a "picture" of yourself from an outside perspective
- Make use of interactive tools that stimulate collateral activities to pure training (books, films, etc.) but which are complementary to the development path
- Agree on precise metrics through which to have more concrete and tangible feedback on the results of the development path

Activities

- She works as a legal adviser in a company
- She asks the intermediary for further details and information for the choice of the development path
- She autonomously decides to embark on a development path or is directed by her manager
- She self-finances its development path or is financed by its company
- She chooses the coach based on development goals
- She self-evaluates itself with respect to its own skills at the beginning of the course
- She carries out self-assessment activities (questionnaire)
- She conducts a brief interview with the coach before returning
- She asks the coach for explanations regarding the return of the profile (assessment)
- She uses material (books) provided by the coach to carry out exercises complementary to the coaching sessions
- She fills out a journey diary

Questions

- Are there any subsidized packages for professionals who self-finance a coaching course?
- What could help me outline my development goals?
- How can I make my managers understand the importance of providing financed training even to employees of low seniority?

Motivations

- Make a career leap
- Overcome your shyness and improve your communication skills
- Stay humble
- Maintain the desire and an active predisposition to learn new concepts

Barriers

- The poor ability on the part of managers to understand the needs of their collaborators
- The lack of a structured activity in the company to identify employee needs
- The absence of financed training and interprofessional funds in your current company
- Lack of financial availability
- The high cost of one-on-one coaching
- The need to self-finance to embark on a coaching journey
- The pre-agreed duration of the coaching sessions due to the terms of the funding
- The difficulty of interpreting the assessment results on your own
- Outline development goals without supporting tools

Tools for identifying needs

- Self-awareness
- Self-assessment with counseling
- Short interviews with the coach
- Absence of business tools

Attitude towards Artificial Intelligence: FEARFUL

- *"And ... what scares me a bit is the massive use of data. So the fact that the data privacy profiles of the people involved are not respected. This is an aspect that in my opinion ... is important."*
- *"But I'm not against it myself, I haven't used it"*

Fig. 24. Personas Christine

RACHEL

THE ENTHUSIASTIC TRAINING PARTICIPANT

"I am a very curious person, and I believe that my quite diverse background bears witness to that."

Profile

Rachel is a girl who loves change, as long as it is an improvement. She currently works as a supervisor in a tourist services company, but she has tried various jobs in her life. Rachel has been dedicated to academic training, pursuing university master's programs, webinars, and seminars that she carefully selected based on her interests. However, once she entered the corporate world, she encountered some issues that prevented her from continuing her targeted education. Until today, she has never really felt heard about her needs; instead, she noticed a lack of involvement from managers in the choice of training courses, which is widely seen as a waste of time. Despite this, Rachel has still welcomed the opportunities offered by the company, although she would have appreciated greater clarity and transparency regarding the motivation behind the proposals. She appreciated the "blended" mode as it allowed her to find more time between work activities. She would like the company to pay more attention to measuring the improvements of participants following training courses, especially regarding personal development aspects. If she has to provide feedback on the journey, she prefers to do it spontaneously and in person (perhaps even during the course) rather than through the usual generic questionnaires, which, in her opinion, do not lead to any real change.

Objectives

- Receiving clarity regarding the predefined course deadlines (enrollment, completion, etc.)
- Being informed from the beginning about the course planning
- Receiving communication on anything that can be supportive during the course
- Always knowing whom to contact if issues arise during the course
- Taking courses with people from diverse professional backgrounds and varied skills
- Using tools that facilitate collaborative work
- Providing feedback (spontaneously) even during the training course and ensuring it gets used
- Benefitting from training opportunities in a "blended" mode as well
- Engaging with someone in person, not artificial, to identify one's development needs

Activities

- She works as a supervisor in a tourist services company.
- Throughout her life, she has changed jobs multiple times, exploring different sectors.
- She has completed two master's degrees in the field of communication.
- She has always chosen training opportunities based on her interests and curiosity.
- Throughout her career, she has attended various courses, webinars, and seminars.
- She participates in numerous mandatory training courses within the company.
- She has consistently provided feedback through questionnaires or phone calls following the training experience.

Questions

- Where can I find information about the training course schedule (deadlines, materials, etc.)?
- Whom can I contact if I encounter an issue during the course?
- What factors could promote a shift away from the top-down approach to training in my company?
- Why do managers not involve us in the selection of training courses?

Motivations

- Acquiring new skills
- Challenging oneself both in personal and professional life
- Advancing in one's career
- Receiving training proposals from one's own company that are tailored to one's needs
- Meeting inspiring people

Barriers

- The company's top-down approach to training (starting from the company's needs and management's vision rather than an analysis of employees' needs)
- The lack of involvement from managers in choosing training courses for their employees
- The widespread perception in the company that "training is a waste of time" (seen as an obligation rather than an opportunity)
- The use of tools that do not facilitate collaboration and group work during classroom training
- The lack of clarity regarding training course deadlines
- The recommendation of training courses solely by artificial intelligence systems
- The absence of a post-course measurement phase
- Collecting feedback through generic questionnaires that bring about no real change

Tools for identifying needs

- Self-awareness
- Lack of corporate tools

Attitude towards Artificial Intelligence: SKEPTICAL

- *"I have the need, which could also be due to a personal inclination, to know that on the other side there are still two ears and two eyes, a thinking human brain that collects and processes information. Surely, artificial intelligence helps with a significant initial screening of information... but I wouldn't trust a choice that is solely suggested by artificial intelligence."*

Fig. 25. Personas Rachel

ROSE

THE COLLABORATIVE HR

"The more the supplier works in symbiosis with us, the more we will be able to be successful within the company"

Profile

Rose is the HR Director of a multinational company. Among the many tasks that compete with you, you deal with the evaluation of employee performance. To do this, she annually carries out an activity called "Gap Analysis", aimed at exploring employee gaps and resources and planning new development plans. To identify the needs of employees, Rose has also decided to promote a survey in the company newspaper which is published monthly. In choosing the supplier, he is guided by his experience; then once you have collected the proposals, you identify the most suitable courses together with the manager. For Rose, successful training is the one that emerges from a symbiotic work between the HR and the consultant; when this does not happen we are always faced with failed experiences. According to Rose, among the main problems that emerge during the training, close attention must be paid to the composition of the classroom and to the situations in which this creates resistance in the free expression of the participants. Another problem is the time commitment that employees have to reserve despite the multiple activities they have to carry out on a daily basis. Furthermore, the difficulty emerges in making employees aware of the need to grow not so much on a technical level as on a relational level. Rose does not appreciate impractical approaches to training and does not find the "classifications" that emerge from the assessments useful. Rose, if satisfied the first time, gives extreme confidence and leaves consultants carte blanche in their work.

Objectives

- Ensure the development of all employees
- Investing in training not only for high potential
- Offer transparency and clarity in the statement of development objectives
- Have a tool that helps to identify the most suitable role for people through the exploration of personal attitudes
- Being able to engage and motivate to grow even people who "are comfortable where they are"
- Work in symbiosis with external training consultants
- Have a common platform among the various stakeholders participating in the training (trainer/coach/intermediary/manager)
- Find the "square" during the briefing
- Debrief the process not only with HR functions, but also with the person's manager
- Facilitate a quantitative monitoring of the path to intervene immediately
- Have a tool that captures the perception of usefulness that employees have with respect to training courses

Activities

- She manages the professional life of each worker from the moment they are hired
- After hiring the person, she takes care of the on-boarding phase
- She takes care of the annual training plan
- She monitors the meetings that the person has with the people manager and defines an individual development path
- She organizes standard courses from above
- She explores employee needs through gap analysis and through a monthly survey promoted in the company newspaper
- If she identifies significant gaps, she tries to hear from the boss to plan the interventions together
- She collects one/two proposals from trainers, coaches, schools; does a console of the data and tries to find the most suitable courses for the person
- She observes training sessions to make sure everything is going well
- She takes care of the issue of engagement to keep people in the company

Questions

- How can we reduce the time for the process of identifying employee development needs?
- How can I engage and motivate senior figures to grow?
- What could help me in choosing the consultant other than experience?
- How can the so-called "classifications" that emerge from the assessments be replaced or returned?

Motivations

- Breaking down people's distrust of AI-powered tools
- Give extreme confidence in others after checking their work
- Follow a logic of sharing to lighten the weight of individual responsibilities
- Maintain the desire to improve even when a change brings suffering

Barriers

- A classroom composition that causes resistance in the free expression of the participants
- The tendency to invest in training mainly for high potential
- The "classifications" that emerge from the assessments
- The time commitment required to identify needs
- The difficulty of engaging employees, in particular for training relating to the emotional/relational sphere
- The absence of assessments during the training process
- The presence of scattered containers of information and the difficulty in managing them
- The economic cost of training
- Impractical and 'Ancient' Training Approaches
- The lack of consistency between the objectives that the company has, the corporate values and the type of approach that the consultant has

Tools for identifying needs

- Survey promoted monthly in the company newspaper
- Gap Analysis to identify gaps
- Talk to the manager

Attitude towards Artificial Intelligence: OPEN WITH RESERVE

- *"I think it can help a lot in managing a greater number of information just to arrive at the decisions to be made. So ... it's as if it could broaden my mind not only with my experiences, but with situations that obviously can represent me ."*
- *"The relational aspect, in my opinion, must still remain, that is, in the sense, the moment of confrontation with the person, must in any case ... remain active."*

Fig. 26. Personas Rose

PHILIP

THE DISILLUSIONED HR

"The issue of training has always been quite thorny. It has always seemed like a hassle."

Profile

Philip works as an HR manager in a cosmetics company. Among his duties, he mainly deals with personnel administration. His technical skills have allowed him to be involved in building an online management system for his company. Philip tries to contribute as much as possible to the cultural growth of his office; however, he realizes that his company has a deeply rooted familial and provincial culture that is difficult to change on his own. In his company, there isn't much focus on employee growth and, consequently, on training activities; in fact, the prevailing sentiment is that training is seen as a 'hassle.' Philip believes that, in addition to the main problem, which is cultural, another obstacle to training is the inadequate staffing levels that make it impossible to dedicate energy to anything other than daily work. Deep down, Philip wishes to change the company's reality to find a context that supports him in pursuing more stimulating challenges. A current desire? Philip would like to be supported by an artificial intelligence-based system to systematize and process the large amount of data he deals with more quickly.

Objectives

- Being supported by an artificial intelligence system for managing extensive databases
- Systematizing the vast amount of data related to employees' work life
- Having the ability over time to change employees' names and genders within management systems
- Building company tools tailored to specific company needs
- Creating a tool that collects employees' needs and makes them available to supervisors
- Generating training programs (both in-house and remote) where it's possible to share experiences
- Providing training courses that enable the company to stay competitive in the market
- Making a repository accessible to all employees where successful experiences are capitalized (which can be used as a model for other parts of the company)
- Measuring certain variables over time from the end of the development journey

Activities

- Works as an HR professional in a cosmetics company
- Primarily involved in personnel administration (e.g., collects employee attendance records and then processes them for payments)
- Conducts mandatory safety training
- In their current company, they have completed only one training course using their personal budget
- Personally contributed to building an online management system for personnel mapping and the management of certain activities
- Leverages their technical knowledge to create increasingly sophisticated tools (such as one for analyzing absenteeism)
- Strives to contribute to the cultural growth of the office

Questions

- How can access to training be made more time-efficient?
- What could the company do to encourage employees' growth?
- How can the perception of training as a 'hassle' be changed?
- How can resistance to training, which is widespread in the company, be reduced?
- Who can support me in building new company tools?

Motivations

- Changing the corporate reality
- Taking on new exciting challenges
- Having more time to devote to personal and professional growth

Barriers

- Employee resistance to training
- Lack of sensitivity and attention from the CEO in choosing training courses
- Company culture and provincial mentality
- Lack of time for employees
- Widespread perception of training as a 'hassle'
- Resource selection aimed at hiring highly senior personnel rather than investing in individuals to be trained
- Poor attitude towards training on hard skills
- Lack of incentives for growth within the company
- Lack of control and management skills for certain resources
- Inadequate staffing levels that make it impossible to engage in activities other than strictly work-related ones

Tools for identifying needs

- Lack of company tools

Attitude towards Artificial Intelligence: OPEN

- *"The managers who do not equip themselves with this type of artificial intelligence-based tools to govern their companies will be losing managers."*

Fig. 27. Personas Philip

CARL

THE VIGILANT PEOPLE MANAGER

"I also monitor the trainer, but I don't do it through questionnaires, I do it live, just as I would do it with my first line"

Profile

Carl is responsible for an internationally renowned company. Among his duties, Carl is in charge of monitoring all the part relating to the evaluation of the performance of his employees to identify targeted development plans. Once the development proposals have been defined, he inserts them into a financing plan and, together with the HR, makes an assessment of the strategic nature of the proposal. Usually as consultants he chooses those with whom he has already had a positive and successful experience. For Carl, the training course must be monitored as much as possible, not only through quantitative feedback (e.g. questionnaires), but also in person, by viewing and observing what is happening and consulting both the trainer and the participants involved vis a vis. According to him, a critical issue for the promotion of new training activities is the lack of information from consultants on funding opportunities that could incentivize the company to spend a larger budget and invest in a greater number of courses. Although Carl believes that direct observation is the most suitable tool for identifying the needs of his collaborators, he believes that "subjectification" can be an important risk in personnel evaluation. Therefore, if he could introduce a new tool in his company, he would ask for support in the collection of self and external evaluations relating to employees, which when cross-referenced can provide an overall and more objective view of the person and consequently direct towards the best development plan.

Objectives

- Give space for employees to express themselves to learn about their skills or other aptitudes that could be significant for their career development
- Systematize and make the collection of training needs more widespread throughout the year
- Have a tool that collects data by crossing what are assessments or self-assessments and people's needs
- Use a data-driven approach that helps to objectify the training/development request
- Have defined goals to measure improvements at the end of the course
- Make employees more aware of their training needs
- Receive continuous and structured feedback on the relationship between manager and collaborators
- Dedicate time to monitoring the training path (not only through questionnaires, but by personally observing and asking)
- Being able to "repair on the go" errors or problems that occur during training courses

Activities

- He participates in institutional moments of comparison for performance evaluation or career conversation to understand potential career plans of the individual within the organization
- He observes how your collaborators work and sees their aptitudes, needs or ambitions, professional and personal characteristics
- He evaluates the collaborators who evaluate you (multi-network evaluation)
- He defines employee development priorities and incorporates them into a grant application
- Together with the HR, he builds training courses or individual paths, totally sharing the information
- He evaluates the strategic nature of the development proposal, discusses it with HR and together identifies the intervention
- He chooses trainers with whom you have already had experience
- He organizes a closing and mid-course meeting with the trainer and the people involved in the course

Questions

- How can the results of a path related to soft skills be measured in a more objective way?
- What could help me in interpreting the assessment tools?
- How can I give resource assessments that are more objective?
- How do I find the time to monitor the training/development paths of the collaborators I have referred?

Motivations

- Receive different evaluations to have an overall and more objective view
- Enhance the ability to observe and perceive typical of a manager
- Set intermediate objectives to facilitate the supervision of results
- Being able to motivate people before training so as not to "waste" the investment

Barriers

- The lack of promotion by consultants of tenders and funding opportunities for training
- The "subjectification" understood as a personal and non-objective evaluation of the resources by the managers
- The problem of measuring soft skills and the need for more time (six months/one year) to evaluate the results of development paths related to these topics
- The difficulty in interpreting assessment tools and the need for mediation to support understanding the results
- The lack of preparation of HR in understanding the functionality of advanced tools based on artificial intelligence
- The difficulty in understanding the technicalities related to tools based on artificial intelligence

Tools for identifying needs

- Performance evaluation
- Career Conversations
- Multi-network evaluation
- Direct observation

Attitude towards Artificial Intelligence: OPEN WITH RESERVE

- *"I think that in general artificial intelligence can support you in making decisions and sometimes relieve you from making simple decisions while leaving room for human intelligence for more complex situations."*
- *"I find it terribly fascinating and I actually see it as an opportunity ... so my approach is definitely not a skeptical and prejudiced one, but an enthusiastic one, because I still believe in technology"*

Fig. 28. Personas Carl

Among these Personas, we chose together with Mylia the most fitting ones, one representative for each target, to present the service functioning to the internal actors of the organization. In particular, we selected:

- **Samuel**, as coach, due to his ability to operate within an inclusive system that encourages active participation from HR and People managers in the coaching process.
- **Christine**, as coachee, aligning with the primary focus of Mylia pilot on the coaching journey. However, we also kept into consideration challenges faced by George and his lack of motivation in the design process.
- **Rose**, designated as the HR representative, for her collaborative attitude. We eliminated Philip because his situation involves constraints linked to organizational culture that fall beyond our direct control.
- **Carl**, established as the sole representative for the People manager category.

From the emerging results, it is evident that the Personas have distinct attitudes and objectives concerning the ultimate potential common goal of organizational development. In fact, each Personas brings unique perspectives, priorities, and challenges to the table. For this reason, to address the specific needs and challenges of the users, we identified tailored

implications to be considered in the design of AHEDA. Some of the user needs were already satisfied by the initial concept of AHEDA; while other emerging implications have become the foundation for conceptualizing new service features. Below is a description of the four selected Personas needs along with their respective design implications.

Christine's Needs

Considering that:

- Christine is a person who actively seeks training opportunities.
- Her main objectives include professional and personal growth, support in defining development goals, and receiving concrete feedback on the results of the development path.
- She faces barriers such as managers' poor understanding of employee needs, the lack of a structured activity in the company to identify those needs, the need for self-financing for coaching, and the pre-established duration of coaching sessions.
- She has concerns about the extensive use of data and privacy violations in relation to AI. However, she has not yet personally experienced or utilized AI.

The design implications derived from her main goals and concerns are directed to:

- Improve managers' understanding of employee needs;

- Establish a structured process for identifying employee needs;
- Enable funding options for coaching in the case of BtoC;
- Introduce flexibility in coaching session duration;
- Address AI-related trust-concerns about data privacy.

Samuel's Needs

Considering that:

- Samuel believes that everyone's work makes more sense when all stakeholders are on board.
- His main objectives involve involving all stakeholders during the coaching process, having support tools to make development needs more objective, and receiving support in interpreting assessment tools for providing feedback to the coachee.
- He encounters barriers such as the lack of involvement and information exchange with the corporate client, difficulties in interpreting technological assessment tools, difficulty in remembering tasks outside of coaching sessions, funding constraints that limit the duration of the course, and the absence of a post-path evaluation phase.
- He acknowledges the potential of AI as a complement to human expertise. He sees AI as an opportunity to handle larger amounts of information for DM, while still valuing the importance of human involvement.

The design implications derived from his needs are aimed at:

- Enhancing involvement and information exchange with the corporate client;
- Developing support tools for objective identification of development needs;
- Providing training on interpreting technological assessment phase;
- Implementing reminders or task management systems;
- Enabling funding options for longer coaching durations;
- Introducing a post-path evaluation phase;
- Integrating AI as a complementary and support tool.

Rose's Needs

Considering that:

- Rose emphasizes the importance of a supplier working in symbiosis with the company to achieve success.
- Her main objectives include offering transparency and clarity in development objective statements, exploring personal attitudes of employees, working in symbiosis with external training consultants, and facilitating quantitative monitoring of the development path.
- The barriers she faces include a tendency to invest in training mainly for high-potential employees, time commitment required to identify development needs, absence of evaluations during the training process,

and a lack of coherence between company objectives, corporate values, and the approach of consultants.

- She believes that AI can significantly aid in managing information and making decisions. She sees AI as a means to expand her experiences and address challenging situations. However, she emphasizes the importance of preserving human contribution in relational activities.

The design implications derived from her main objectives and barriers are directed to:

- Expand training opportunities beyond high-potential employees;
- Streamline the process of identifying development needs;
- Incorporate evaluations throughout the training process;
- Foster coherence between company objectives, values, and consultant approaches;
- Leverage AI for managing information and DM;
- Facilitate collaboration with external coaches or training consultants.

Carl's Needs

Considering that:

- Carl takes an active role in monitoring the coach and focuses on live feedback rather than questionnaires.
- His main objectives involve systematizing the collection of development needs, defining goals to measure improvements, making employees

more aware of their training needs, and being able to address errors or problems that arise during training courses.

- The barriers he encounters include consultants' lack of promotion of tenders and funding opportunities for training, the need for more time to measure the effect of development paths on soft skills, difficulties in interpreting assessment tools, and understanding technicalities related to AI-based tools.
- Carl believes that AI can assist in DM, particularly for simpler tasks, while reserving the role of human intelligence for more complex scenarios. He holds an optimistic outlook on technology and embraces AI as an opportunity.

The design implications derived from his needs and motivations are aimed at:

- Enabling the possibility to easily monitor the development path;
- Incorporating evaluations throughout the training process;
- Improving communication and promotion of tenders and funding opportunities;
- Allocating extra time for measuring the impact of development paths on soft skills;
- Providing training on interpreting assessment tools;
- Offering training on technicalities related to AI-based tools;
- Emphasizing the collaboration between AI and human intelligence.

A final remark is needed to address what emerges from these profiles regarding the managers' attitudes toward AI. Both managers, the HR manager, and the People manager, exhibit an attitude towards AI designed as *"open with reserve"*, meaning a generally positive attitude with some reservations. In fact, both Personas, Rose, and Carl, agree on the importance of preserving human input for complex decisions or activities that involve interpersonal relationships. This finding is consistent with what emerges from the literature analysis, particularly the need for maintaining decision control over complex managerial decisions.

7.2.3 Activity Diagram

7.2.3.1 Research Tool Description

Through a supplementary analysis of the narrative interviews, based on the second level coding (see the previous paragraph on *Thematic Analysis*), we have extracted data to create the Activity Diagram. The Activity Diagram (**Fig. 29**), also known as *Mental Model*, can be used in different phases of the SDT process, as it helps to analyze large amounts of data. Indi Young (2008), creator of the Mental Model diagram, describes it in terms of mental representations that people use to understand and explain the world, generalizations that do not consider the contextual nature of activities. Unlike the definition of practitioners, the Activity Diagram is employed by psychologists as a diagram of activities in which it is indicated what the user

performs through the mediation of artifacts. In this perspective, the Activity Diagram is considered related to two principles of AT (Leont'ev, 1974, 1978): the hierarchical structure of activities and the mediation of instruments.

Specifically, the hierarchical structure of AT is visible in the upper part of map, which includes the key elements that make up the Activity Diagram:

- **Operations**: represent tasks that users perform during their work routine and are also identified as "*molecules*" because they constitute the basic material for the creation of the model. In the hierarchical structure of AT, they refer to the layer of *operations*: routine processes oriented toward the conditions under which the subject is trying to attain a goal.
- **Actions**: are aggregates of related operations. In the hierarchical structure of AT, they refer to the layer of *actions*. Actions are considered as components of activity, referred to a specific goal under the motive of the activity.
- **Activities**: represent the context in which the choices made by users are expressed. In the hierarchical structure of AT, they refer to the layer of *activities* that are oriented toward a motive, not immediately revealed to consciousness (Kaptelinin & Nardi, 2006).

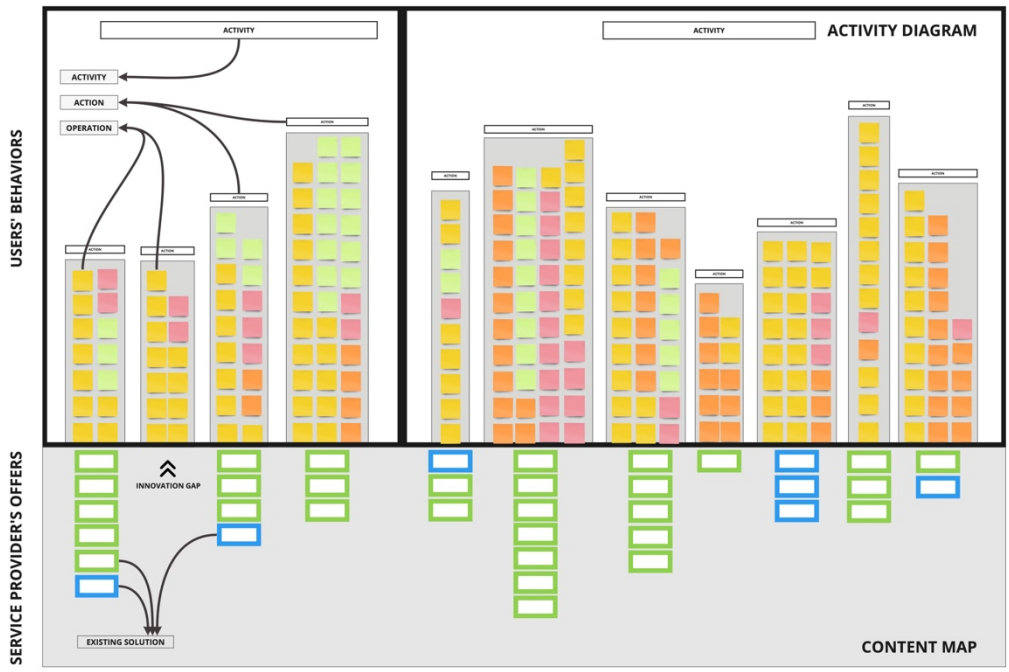


Fig. 29. *Structure of Activity Diagram*

On the other hand, the mediation of instruments is referred to the lower part of the Activity Diagram, called "*Content Map*" (**Fig. 29**). The Content Map is constituted by the *features*, i.e., the tools, services, and solutions which, in the current state of the analysis, support the specific activities mapped in the diagram. Where tasks and supports are aligned, a solution emerges; where they are not, a design opportunity, or a possibility of innovation takes place. However, in our specific case, since the core of the service had already been designed by the provider organization, the content map was used to define potential service functionalities to integrate.

7.2.3.2 Results and Design Implications

To fill the Activity Diagram, we included the analysis of the sixteen interviews from the User Research for the upper part and we set up one co-creation meeting with the members of Mylia's Design & Innovation team for the definition of the Content Map. From the interviews, we identified and ordered chronologically the following **16** activities, each including different actions with operations belonging to different targets, distinguished on the basis of their specific color code:

1. *Identifying Training and Development Needs in the Company;*
2. *Engaging Employees in Development;*
3. *Finding out About Training/Development Courses;*
4. *Deciding to Undertake a Training/Development Path;*
5. *Choosing Consultancy;*
6. *Financing Training/Development Courses;*
7. *Profiling;*
8. *Providing the Profiling Results;*
9. *Choosing Candidates for Training/Development;*
10. *Negotiating the Training/Development Path;*
11. *Designing the Training/Development Path;*
12. *Providing/Doing Training;*
13. *Undertaking a Development Path;*
14. *Interrupting a Training/Development Path;*

15. Requesting Feedback on the Training/Development Path;

16. Measuring Output at the End of the Path.

These activities depict the journey undertaken by the several Personas in pursuing a path of training or development. The journey begins with the identification of training/development needs and culminates in the measurement of achieved outcomes. Within this Activity Diagram, both training and development have been explored, as the decision to focus solely on coaching came later.

The use of this tool allowed us to create a first bridge between the needs of users with those of the provider organization, since it allowed the identification of the unmet needs of the Personas by matching them with the services already offered by Mylia. This process consented to identify various functionalities to be integrated into AHEDA. The following are the activities and their specific actions where we have identified unmet needs that require new functionalities:

- **Activity: Finding out About Training/Development Courses**
    - *Action: Receiving Communication on Social Media*
- **Activity: Choosing Consultancy**
    - *Action: Selecting Coach*
- **Activity: Providing/Doing Training**
    - *Action: Receive precise communications*

    - *Action: Use work/communication tools*
    - *Action: Monitor the training in progress*
- **Activity: Providing/Doing Training**
    - *Action: Investigating development needs through questions*
    - *Action: Assigning/performing tasks during the journey*
    - *Action: Communicating with the coach*
    - *Action: Aligning during the development journey for monitoring*
- **Activity: Requesting Feedback on the Training/Development Path**
    - *Action: Asking feedback from participants in a structured manner*
    - *Action: Requesting feedback from the teacher*
- **Activity: Measuring Output at the End of the Path**
    - *Action: Evaluating the timing for measurement*

In the following sections, we will analyze each of these activities one by one, providing a detailed description of the envisioned functionalities. Each of these functionalities addresses specific needs of one or more target Personas, which is why the visualization of these features will also be enabled based on the specific user roles. In addition, it is important to specify that some needs emerged concurrently with the training and development journey. Therefore, some functionalities have been extended to both cases. In fact, even though our current focus is on coaching, in the future, the AHEDA service will expand to include training. Consequently, some of these functionalities have already been planned for the future AHEDA extension.

Fig. 30. *Activity Diagram*

Activity: Finding out About Training/Development Courses

Fig 31. *First portion of Activity Diagram*

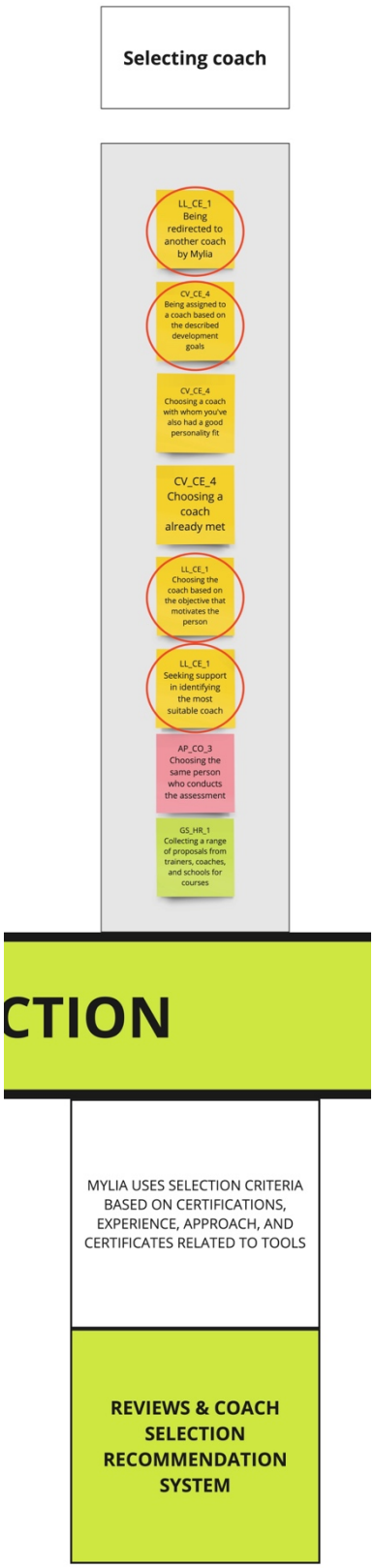
AHEDA's Functionality: Certification Badge

In this *activity* (**Fig. 31**), there is a recognition of the *Motivated Coachees'* need to improve communication in order to reach a broader audience using various communication channels, such as social media.

"Thinking that they need to improve communication to reach more individuals, even on social media" (LL_CE_1)

To this end, a method has been designed to promote the sharing of achievements through the service by using a certification badge that verifies the accomplishment of goals at the end of the AHEDA program. In detail, once the program is successfully completed, participants can download a certification badge directly from AHEDA's web app and share it on LinkedIn, further promoting and relaunching the service, especially for BtoC cases. This tool also leverages one of the most complex needs of individuals, which, according to Maslow's Hierarchy of Needs (1954), is referred to as the need for *self-actualization*. When a person successfully completes a program or achieves a significant goal, it represents a moment of personal fulfillment. The certification badge obtained through the program becomes a tangible proof of this accomplishment. In this way, sharing the badge on LinkedIn is not just a demonstration of success but also a means to cultivate a sense of personal fulfillment through the connection with one's professional community.

Activity: Choosing Consultancy



AHEDA's Functionality: Reviews & Coach Selection Recommendation System

As evidenced by the color-coded of the post-its, in this *action* (**Fig. 32**), named "***Selecting Coach***", the *Motivated Coachees* primarily express the desire to find a coach suitable for her.

"Seeking support in identifying the most suitable coach" (LL_CE_1)

Therefore, this becomes a need for Mylia to have tools that can better guide the coach selection process, not only based on the coach's skills and qualifications, as already happen, but also on the coachee's characteristics and goals.

"Being assigned to a coach based on the described development goals" (CV_CE_4)

Fig. 32. *Second portion of Activity Diagram*

Hence, the idea of integrating the review tool implies that at the conclusion of the final feedback session, coachees will be invited to provide qualitative and quantitative reviews of the coach, the intervention, and AHEDA service in general. These reviews will contribute to evaluating the effectiveness of the program and informing future improvements. In addition, they will provide valuable information for the development of AI in giving suggestions on which professionals to choose for targets with similar characteristics.

Activity: Providing/Doing Training

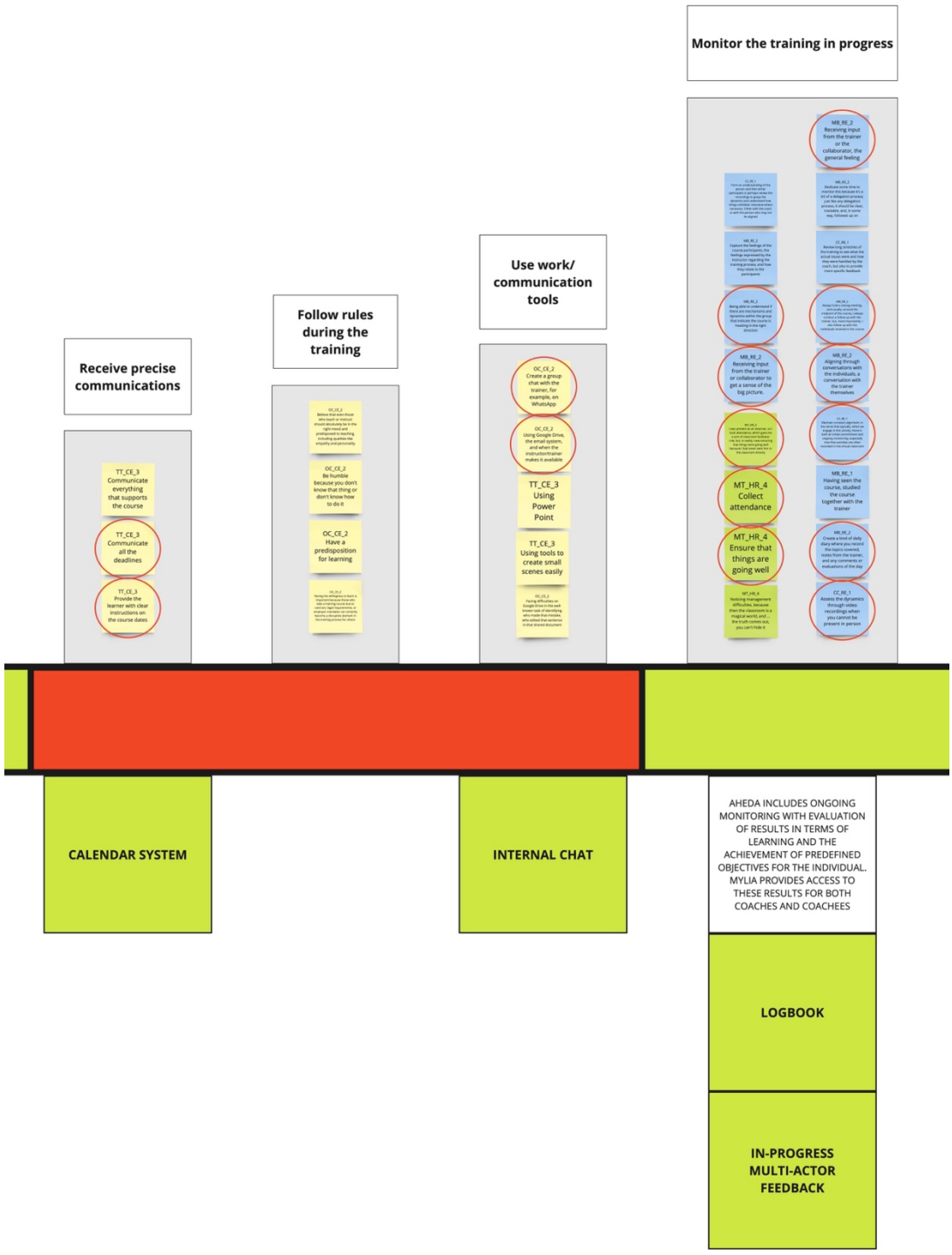


Fig. 33. *Third portion of Activity Diagram*

AHEDA's Functionality: Calendar System

In the first *action* (**Fig. 33**), named *"**Receive precise communication**"*, there is a need for having detailed scheduling right from the beginning of the course.

"Provide the learner with clear instructions on the course dates" (TT_CE_3)

This need is expressed by the *Enthusiastic Training Participants*. However, we have also considered extending this functionality to the coaching program. Specifically, this proposed feature operates as follows: coaches will have access to a calendar that displays pre-scheduled appointments with coachees from the beginning of the program. Reminders are integrated to prompt coach confirmation at the end of each session, ensuring optimal scheduling and coordination.

AHEDA's Functionality: Internal Chat

In the *action* (**Fig. 33**) named *"**Use work/communication tools**"*, we have identified the use of private messaging channels like WhatsApp by the *Enthusiastic Training Participants*.

"Create a group chat with the trainer, for example, on WhatsApp" (OC_CE_2)

This habit conflicts with the need that emerged during the SOC from the provider organization, which requires distancing from the Mylia brand. From this, the idea of creating an internal chat feature within the AHEDA web-app has arisen, enabling seamless communication between coachees, trainers - who are partners with Mylia - and participants without detaching from the Mylia brand, thus creating a unique omnichannel experience. This instant messaging functionality promotes timely collaboration, stimulation, and support.

AHEDA's Functionality: LogBook

In the *action* (**Fig. 33**) named *"**Monitor the training in progress**"*, it is evident that *Vigilant People Managers* and *Collaborative HR Managers* need to maintain continuous alignment with trainers. However, it seems they do it in a rather unstructured manner.

"Receiving input from the trainer or the collaborator, the general feeling" (MB_RE_2)

Only some *Vigilant People Managers* are accustomed to receiving a logbook where all activities conducted during training sessions are tracked.

"Create a kind of daily diary where you record the topics covered, notes from the trainer, and any comments or evaluations of the day" (MB_RE_2)

We found this possibility highly beneficial. Therefore, we proposed integrating it into the web-app to make it more easily shareable.

Precisely, the logbook will allow both the coach/trainer and the participant to record activities and topics discussed during each session. It will offer the option to save drafts and finalize entries at the end of the program. Some sections of the logbook are shared with HR and the People manager, enabling better tracking and documentation of the coaching/training journey.

AHEDA's Functionality: In-Progress Feedback

As anticipated, in the *action* (**Fig. 33**) named *"**Monitor the training in progress**"*, it is evident that *Vigilant People Managers* and *Collaborative HR Managers* have a need for continuous alignment, not only at the end but also at various intermediate points of the journey. This is to ensure that everything is proceeding well and to make course corrections before the program concludes.

Some *Collaborative HR Managers* do this through direct observation.

"I was present as an observer, so I took attendance, which gave me a sort of classroom facilitator role, but, in reality, I was ensuring that things were going well because I had never seen him in the classroom directly" (MT_HR_4).

Some *Vigilant People Managers* use video recordings for assessment when they cannot be physically present.

"Assess the dynamics through video recordings when you cannot be present in person" (CC_RE_1).

However, quite frequently, both of them engage in unstructured conversations with participants and trainers for the purpose of alignment.

"Aligning through conversations with the individuals, a conversation with the trainer themselves" (MB_RE_2).

Nevertheless, this approach leads to significant time loss and can encounter resistance from coaches who perceive it as excessive interference within the program. It can also raise ethical concerns.

For this reason, to establish boundaries while meeting the needs of all stakeholders, it was decided to better structure the feedback and monitor process, also involving managers to provide an assessment of the progress perceived.

Therefore, midway through the program, both the coachee/participant, the coach/trainer and the People manager will have the opportunity to provide

feedback on the coaching/training journey. These feedbacks are shared with the coach/trainer, the People manager, and the HR. Sample questions cover the perceived usefulness of the program, observed changes, appreciation for specific aspects, suggestions for improvement, and alignment with initial goals. These points were derived from the interviews.

Activity: Undertaking a Development Path

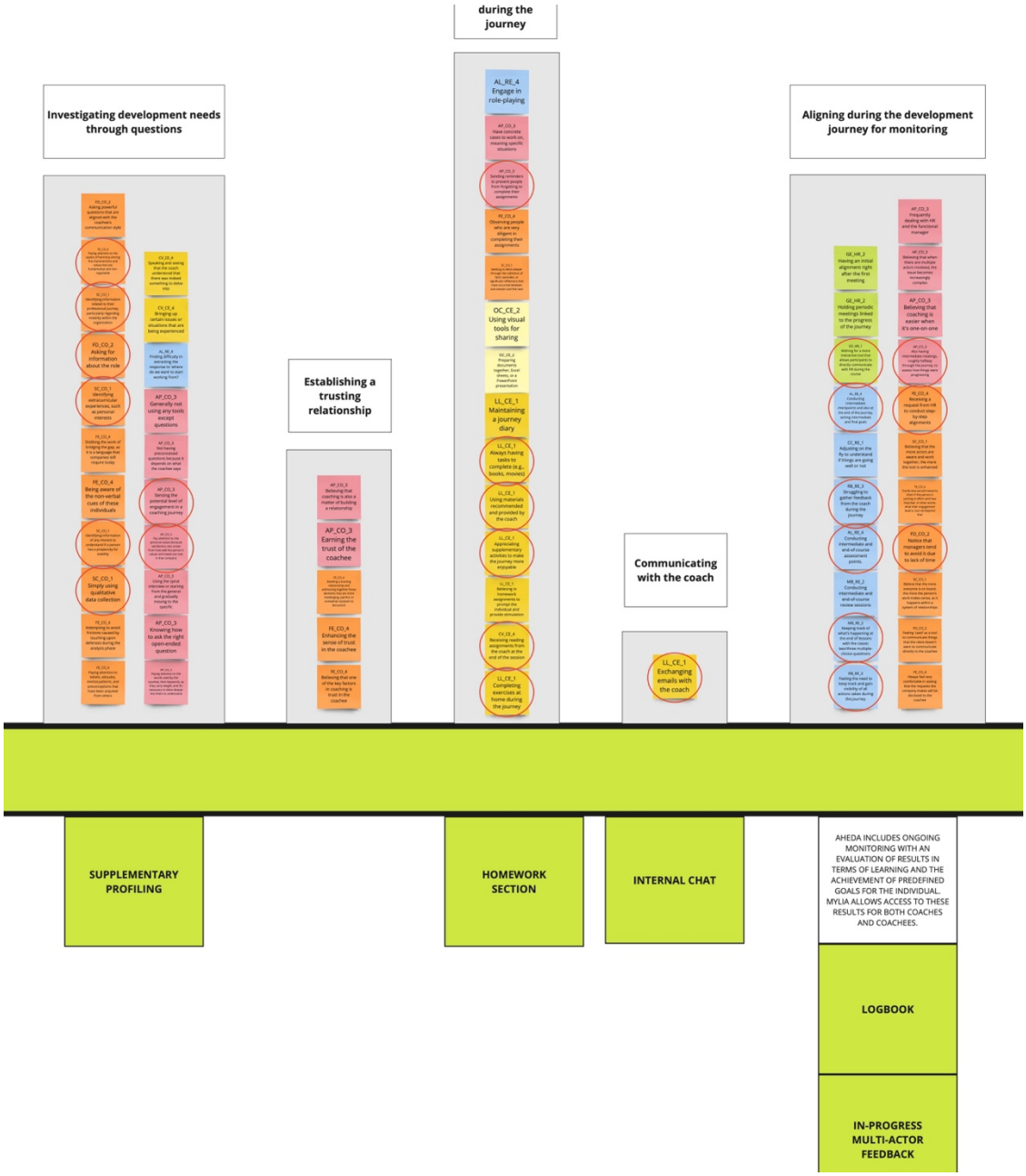


Fig. 34. *Fourth portion of Activity Diagram*

AHEDA's Functionality: Supplementary Profiling

In the *action* (**Fig. 34**) "**Investigating development needs through questions",** we have extracted valuable information from the operations of *Inclusive* and *Exclusive Coaches* regarding the key development indicators for individuals in this context.

"Paying attention to the aspect of harmony among the characteristics and values that are fundamental and non-negotiable" (FE_CO_4)

"Asking for information about the role" (FD_CO_2)

"Identifying extracurricular experiences, such as personal interests" (SC_CO_1)

Based on all the information collected in this *action*, we have created a supplementary profiling focused on the personal and professional history of the participant. This information assists coaches and trainers in selecting the appropriate target profiles and paths for professionals among the recommendations of the AI system, which is based on the AHEDA psychological questionnaire.

Sample questions will include the current role in the company, work experience duration, frequency of job changes, interests, values, motivation levels, and availability for development activities.

AHEDA's Functionality: Homework Section

In the *action* (**Fig. 34**) ***"Assigning/performing homework during the journey"***, there is a perception of the *Motivated Coachees'* interest and willingness to integrate the program with supplementary activities that can help them grow in their development areas, especially if linked to their interests.

"Appreciating supplementary activities to make the journey more enjoyable" (LL_CE_1).

With the aim of creating a holistic and recognizable service, we have considered introducing a dedicated section for homework. In this section coaches can assign materials such as streaming films, e-books, and exercises for completion between sessions. Coachees will receive reminders for these assignments, ensuring continuous engagement. This addresses the concern expressed by coaches about participants forgetting their assignments.

"Sending reminders to prevent people from forgetting to complete their assignments" (AP_CO_3)

AHEDA's Functionality: Internal Chat

In the context of coaching, as indicated in the *"**Communicating with the coach**" action* (**Fig. 34**), there is a clear use of formal and indirect communication tools (such as email) by the *Motivated Coachees*.

"Exchanging emails with the coach" (LL_CE_1).

Furthermore, the minimal presence of post-it notes suggests that this aspect may have been overlooked or received little attention up to this point.

Therefore, to facilitate communication and increase engagement, we have introduced an AHEDA internal chat for the coaching service as well. This chat feature will offer a more interactive and immediate mode of interaction in addition to the traditional email communication. As mentioned earlier, it will also serve as a way to maintain a connection with the Mylia brand, thus creating a distinctive omnichannel experience.

Activity: Requesting Feedback on the Training/Development Path

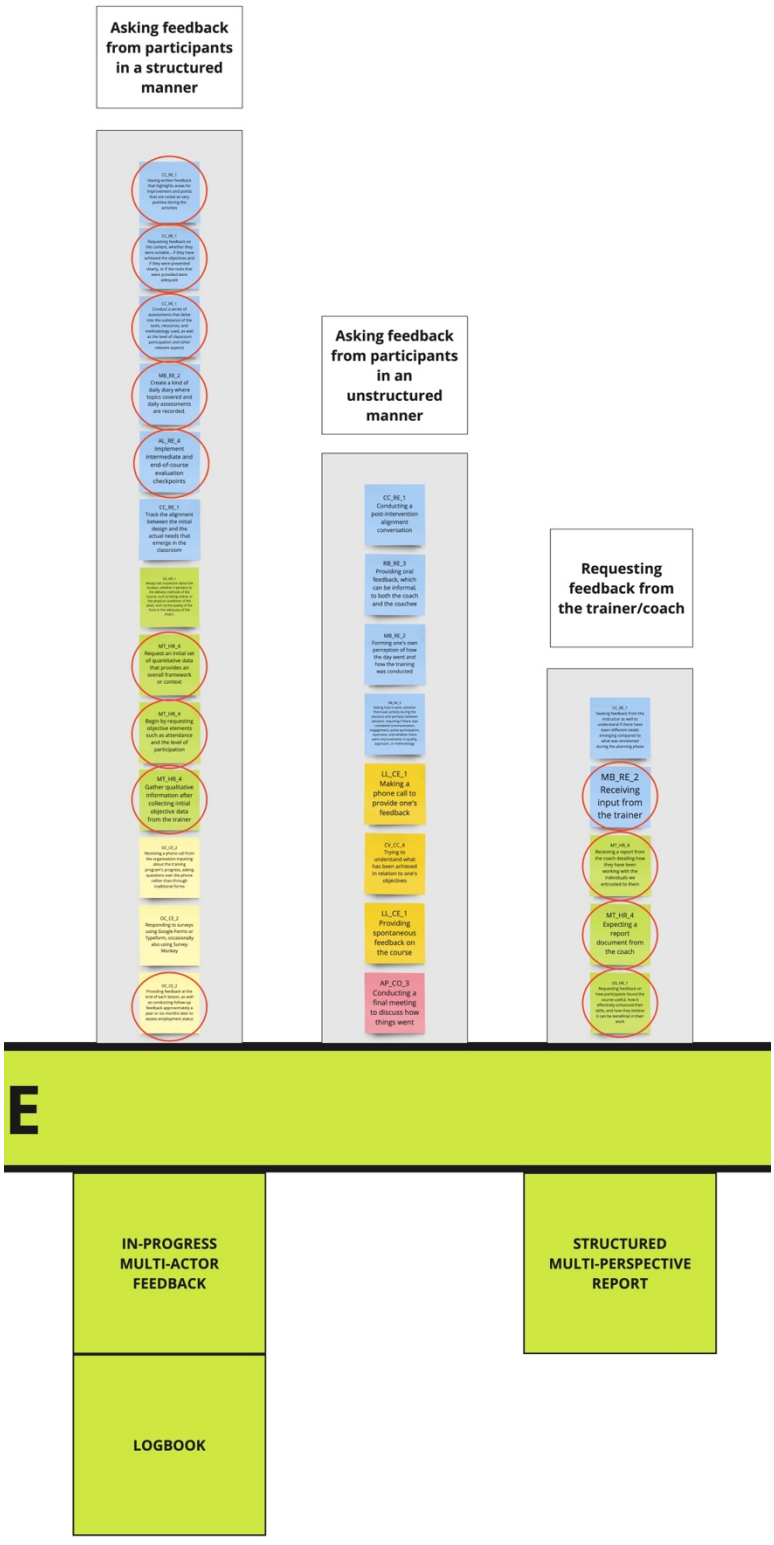


Fig. 35. *Fifth portion of Activity Diagram*

AHEDA's Functionality: In-Progress Feedback

From the *action* (**Fig. 35**) *"**Asking Feedback from Participants in a Structured Manner**",* a need has emerged from *Vigilant People Managers* and *Collaborative HR Managers* to monitor the progress of development/training journeys.

"Feeling the need to keep track and gain visibility of all actions taken during the journey" (RB_RE_3)

"Conducting intermediate checkpoints and also at the end of the journey, setting intermediate and final goals" (AL_RE_4)

This is why this feature has been extended to both cases to cater to people and HR managers' requirements for ongoing monitoring and structured assessment throughout the development journey.

Tool: Structured and Multi-perspective Report

From the *action* (**Fig. 35**) "**Requesting feedback from the trainer/coach"** there arises the practice and widespread expectation among *Collaborative HR Managers* to receive a structured report at the end of the development/training journey.

"Receiving a report from the coach detailing how they have been working with the individuals we entrusted to them" (MT_HR_4).

To address this, we have considered redesigning a format within the AHEDA web-app to follow a precise methodology for compilation. This report takes into account feedback not only from coachees/participants, coaches, or trainers but also from the People manager. The structure of this format has been derived from the guidance provided by HR during the interviews. Concretely, a provided format will guide coaches in documenting various aspects, including the program's content, methodology, alignment with the initial design, achieved milestones, interpretation of profiling results, and qualitative feedback from the People manager and coachee. This report will remain accessible and downloadable for HR, the People manager, the coach, and Mylia's admin.

Activity: Measuring Output at the End of the Path

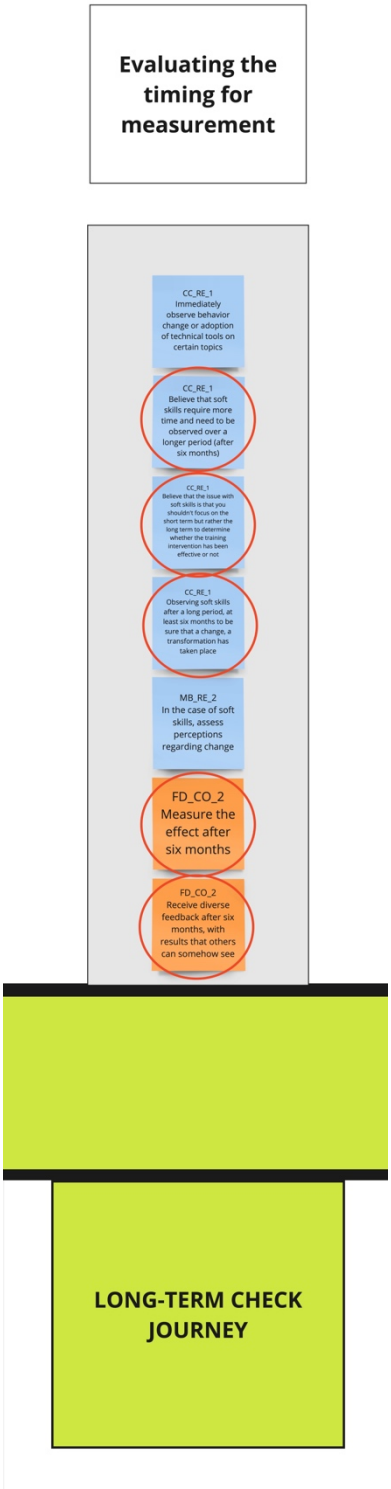


Fig. 36. Sixth portion of Activity Diagram

AHEDA's Functionality: Long-Term Check Journey

In this *action* (**Fig. 36**), named *"**Evaluating the timing for measurement**"*, a need arises from *Vigilant People Managers* and *Inclusive Coaches* regarding the appropriate timing for assessing courses that focus on soft skills.

"Observing soft skills after a long period, at least six months to be sure that a change, a transformation has taken place" (CC_RE_1)

To address this need, we have proposed the option of extending the development program for six months, with this option being recommended. This extension is referred to as the *"Long-term check journey"*. During these six-months, the coach will provide online stimuli to the coachee related to their development journey. After the completion of these six months, the

outcomes will be measured. This timeframe is considered sufficient for People managers to gain tangible insights into the changes in soft skills. Despite this option being designed for the coaching program, we believe it can be extended to training as well, making it group-based rather than individual, if the company's budget allows for it.

7.2.4 Service Ecology Map

7.2.4.1 Research Tool Description

After modeling in detail all the activities of AHEDA service users and conceptualizing the features to integrate, we used the first design tool: the Service Ecology Map (**Fig. 37**). This tool consents to have a concrete representation of the complexity of the service environment and of the multiplicity of actors to involve. Indeed, Service Ecology Maps are particularly useful in the early stages of design, as they offer a means of establishing a shared overview of the work and DM space. According to Andy Polaine et al. (2013), the Service Ecology Map has three main purposes:

- Mapping service actors and stakeholders;
- Investigating relationships that are part of or influence the service;
- Generating new service concepts by reorganizing the way actors work together.

More specifically, the map is composed by the following segments, which should be read level by level in a circular way:

- *Who*: defines who are the main actors acting at each stage of the service;
- *What*: reports what are the actions and DM that the actors carry out in the different phases;
- *Where*: describes in which contexts, physical or digital, the actions and DM take place (*touchpoints*);
- *How*: shows what are the tools that enable actors to perform actions;
- *Why*: explains what are the reasons why those actions or decisions are carried out in those phases of the service.

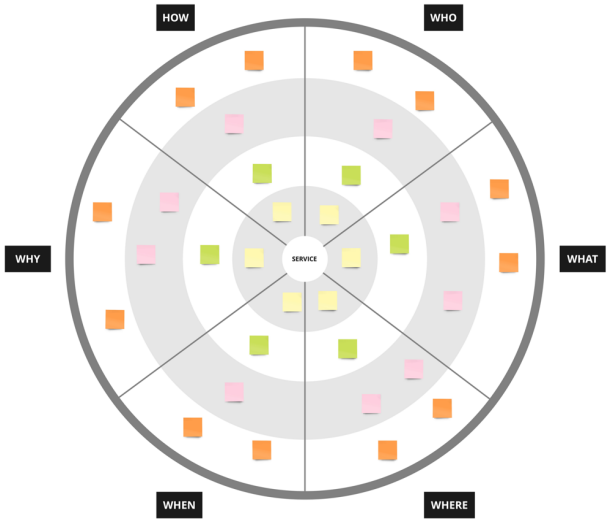


***Fig. 37**. Structure of Service Ecology Map*

7.2.4.2 Results and Design Implications

Below, we present the tool in its visual format (**Fig. 38**). Each stage of the service delivery is represented with a different color. The *Monitoring* and *Evaluating* stages are represented at the same circular level because they occur simultaneously.

Fig. 38. *Service Ecology Map*

Based on the Service Ecology Map, **Table 7** presents the engagement of the different actor categories in the primary stages of the service delivery, encompassing distinct user actions and DM processes.

Stages of service delivery	Mylia	Coachee	Coach	People manager	HR manager
Promoting the service	X				
Engaging		X	X	X	X
Negotiating and identifying the development path	X	X	X	X	X
Providing/Following the development path	X	X	X		
Monitoring			X	X	X
Evaluating		X	X	X	
Delivering outcomes		X	X	X	X
Relaunching the service	X	X			X

Tab. 7. *Involvement of actors in the various stages of the service delivery*

The stages of the service delivery and their brief descriptions are presented below:

- *Promoting the service:* Mylia takes the lead in promoting the service, indicating their primary responsibility in creating awareness and generating interest in the service through the department of Sales and Marketing & Communication.
- *Engaging*: coaches, people managers, and HR managers are all actively involved in the engagement stage. Their participation is crucial in fostering commitment in the coachees toward the development opportunity.
- *Negotiating and identifying the development path:* coachees, coaches, People Managers, and HR Managers meet to negotiate and determine the development path that best suits the coachee's needs, and the corporate

strategy. Designers from Mylia manage service customization based on the identified needs.

- *Providing/Following the development path:* coaches play key roles in the development path. They participate directly in the development process, favoring the acquisition of new skills and knowledge. Coachees are the objects of this stage. Designers from Mylia supervise the coach in the initial phase of interpreting the profile and choosing the path.
- *Monitoring*: monitoring is primarily carried out by people managers and HR managers. They take responsibility for tracking progress, ensuring that the development path is on track and that is meeting the predefined objectives.
- *Evaluating*: coaches, People managers, and HR managers are all involved in evaluating the effectiveness of the service. They provide feedback, assess outcomes, and determine whether the path has achieved its desired impact. Coachees are the objects of this evaluation.
- *Delivering outcomes*: coachees, coaches, People managers, and HR managers are all engaged in this stage. Precisely, the coach will present the results of the coachee's development path to the HR and the people manager.
- *Relaunching the service:* Mylia, coachees, and coaches have responsibilities in relaunching the service. The coach contributes by sharing the certification of the AHEDA training course on LinkedIn; the

coachee by sharing the badge received upon completing the development path. On the other hand, Mylia communicates new funding opportunities to HR managers.

Service Ecology Map also served as an initial basis for constructing the User Journey of the service, which provided a comprehensive depiction of the interactions among the various Personas.

7.2.5 MADM flow

7.2.5.1 Research Tool Description

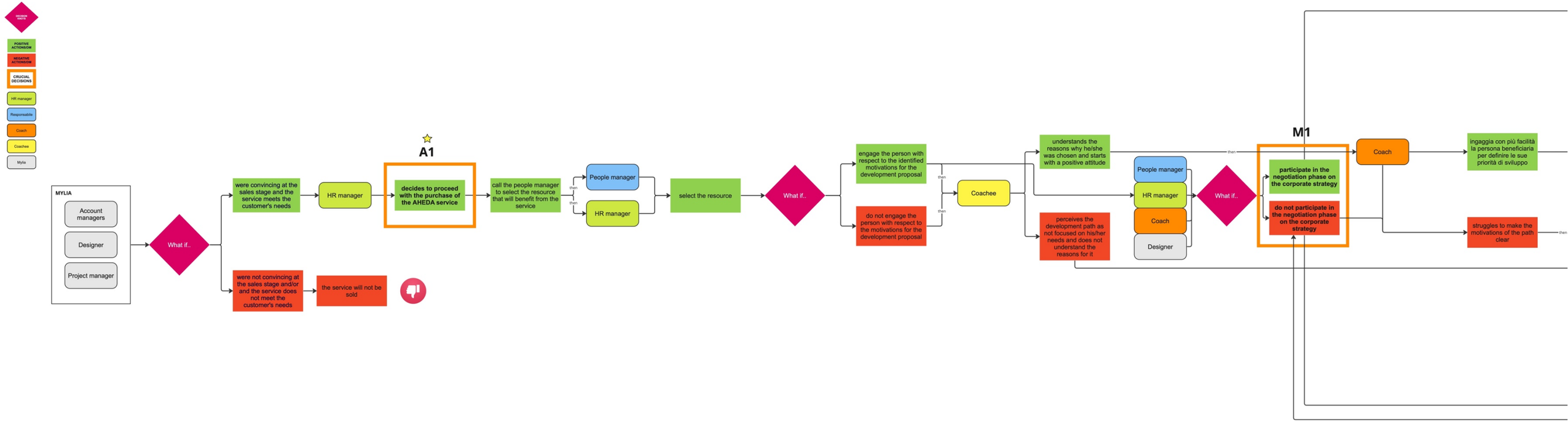
Subsequently, we developed a User Journey Map for each of the selected Personas to define in detail the user experience of the service from the points of view of all the actors involved. Starting from the creation of this tool, we recognized the need to re-adapt it for the specific purpose of AHEDA as a MADSS, and to deeply understand and support the MADM during the overall process. To this aim, we have restructured the four User Journey Maps into a unique diagram: the *MADM flow* (**Fig. 39**), which describes how Personas engage in DM and interact with one another. Concretely, we combined the four User Journey Maps to capture the sequential actions and decisions of the Personas. Through the MADM flow, in fact, we incorporated the temporal component, focusing not only on individual decision moments but also on the sequential DM processes of each actor in achieving their objectives. We have introduced the element of temporality, represented through the flow diagram,

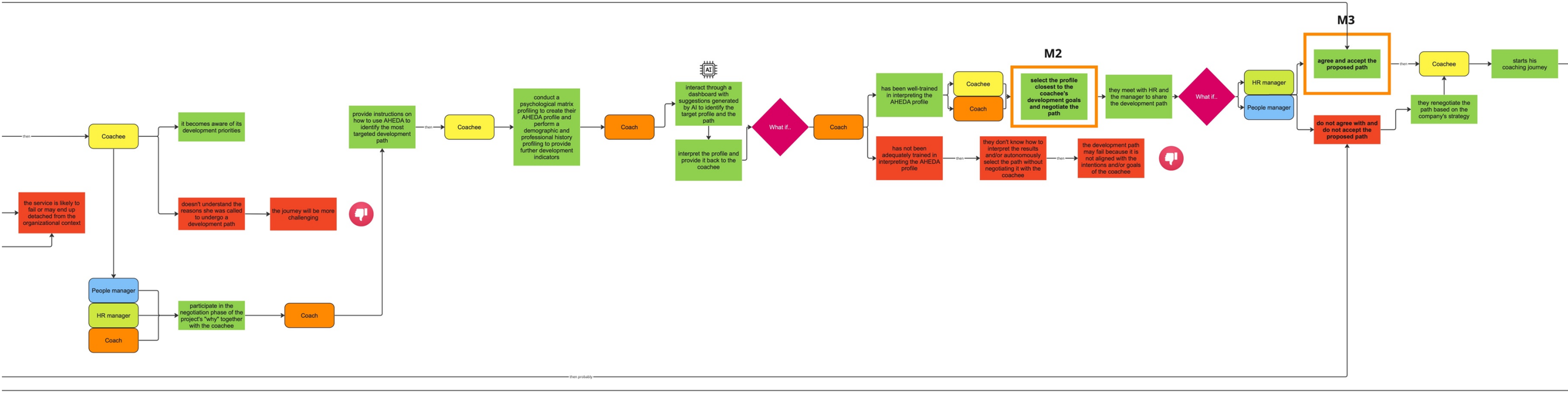
to visualize the hierarchy of decisions and identify the actors responsible for decision autonomy (marked in the diagram with a little star). Additionally, within the flow, we can identify multi-actor decisions where multiple actors are involved in the DM process before reaching a decision knot. Furthermore, throughout the flow, we can also recognize all the decisions that, for temporary and logical reasons, require consensus from other actors. The structure and the legend regarding the shapes and colors we used for modeling the MADM flow is similar to the one we used for creating the *Organizational DM flow*. In fact, decision knots are represented in the diagram as *fuchsia diamonds* and stand for *"what if"* questions. From there two possible paths branch off:

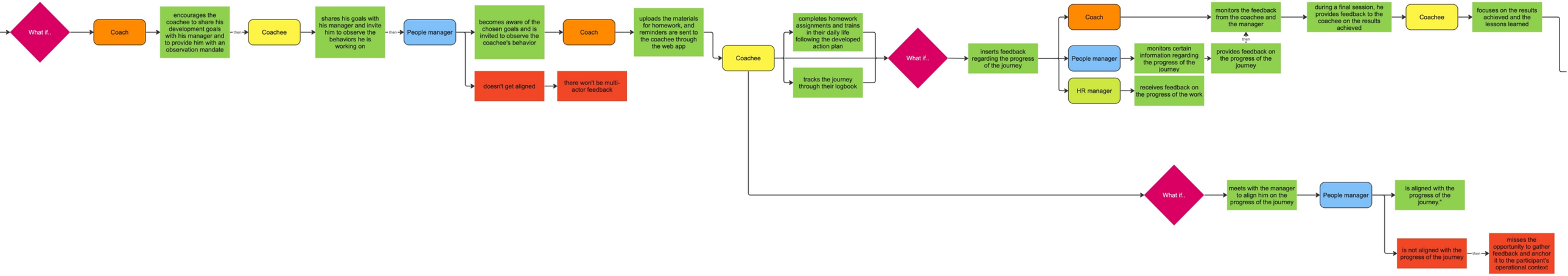
- a positive one, colored in green, represents favorable actor's behaviors or DM processes which allow to continue with the life flow and success of the service;
- a negative one, highlighted in red, shows unfavorable actor's behavior for the life flow of the service.

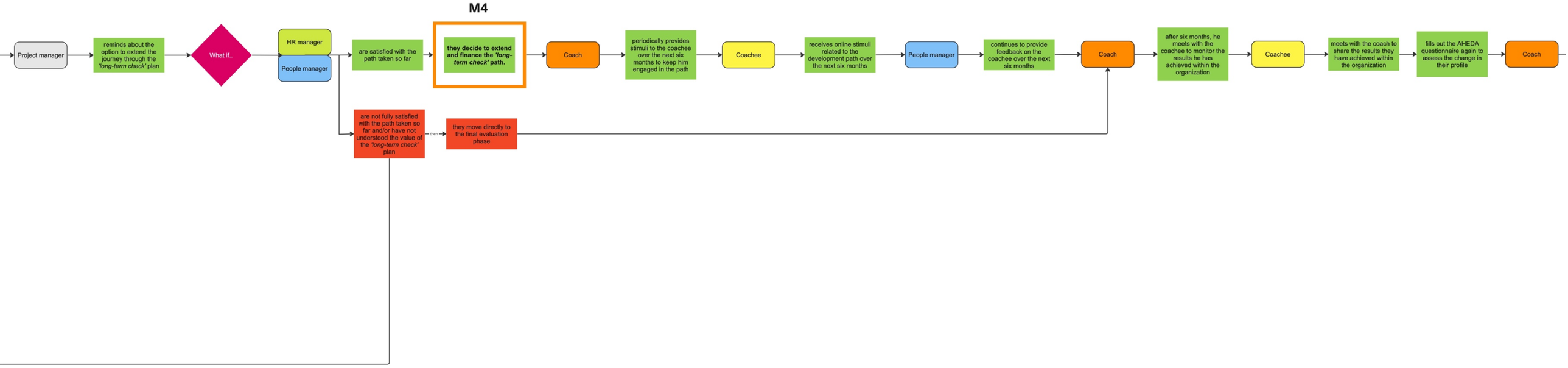
In addition, crucial decisions are framed with an orange rectangle and the actors involved are visually distinguished on the basis of the Personas color code.

7.2.5.2 Results and Design Implications




M3
M2
then
Coachee
it becomes aware of its development priorities
doesn't understand the reasons she was called to undergo a development path
the journey will be more challenging
the service is likely to fail or may end up detached from the organizational context
People manager
HR manager
Coach
participate in the negotiation phase of the project's "why" together with the coachee
Coach
provide instructions on how to use AHEDA to identify the most targeted development path
then
Coachee
conduct a psychological matrix profiling to create their AHEDA profile and perform a demographic and professional history profiling to provide further development indicators
Coach
AI
interact through a dashboard with suggestions generated by AI to identify the target profile and the path
interpret the profile and provide it back to the coachee
What if..
Coach
has been well-trained in interpreting the AHEDA profile
Coachee
Coach
select the profile closest to the coachee's development goals and negotiate the path
has not been adequately trained in interpreting the AHEDA profile
then
they don't know how to interpret the results and/or autonomously select the path without negotiating it with the coachee
then
the development path may fail because it is not aligned with the intentions and/or goals of the coachee
they meet with HR and the manager to share the development path
What if..
HR manager
People manager
agree and accept the proposed path
do not agree with and do not accept the proposed path
then
Coachee
they renegotiate the path based on the company's strategy
starts his coaching journey
then probably


What if..
Coach
encourages the coachee to share his development goals with his manager and to provide him with an observation mandate
then
Coachee
shares his goals with his manager and invite him to observe the behaviors he is working on
then
People manager
becomes aware of the chosen goals and is invited to observe the coachee's behavior
doesn't get aligned
there won't be multi-actor feedback
Coach
uploads the materials for homework, and reminders are sent to the coachee through the web app
Coachee
completes homework assignments and trains in their daily life following the developed action plan
tracks the journey through their logbook
What if..
inserts feedback regarding the progress of the journey
Coach
monitors the feedback from the coachee and the manager
then
during a final session, he provides feedback to the coachee on the results achieved
Coachee
focuses on the results achieved and the lessons learned
People manager
monitors certain information regarding the progress of the journey
provides feedback on the progress of the journey
HR manager
receives feedback on the progress of the work
What if..
meets with the manager to align him on the progress of the journey
People manager
is aligned with the progress of the journey."
is not aligned with the progress of the journey
then
misses the opportunity to gather feedback and anchor it to the participant's operational context


M4
Project manager
reminds about the option to extend the journey through the 'long-term check' plan
What if..
HR manager
People manager
are satisfied with the path taken so far
they decide to extend and finance the 'long-term check' path.
Coach
periodically provides stimuli to the coachee over the next six months to keep him engaged in the path
Coachee
receives online stimuli related to the development path over the next six months
People manager
continues to provide feedback on the coachee over the next six months
Coach
after six months, he meets with the coachee to monitor the results he has achieved within the organization
Coachee
meets with the coach to share the results they have achieved within the organization
fills out the AHEDA questionnaire again to assess the change in their profile
Coach
are not fully satisfied with the path taken so far and/or have not understood the value of the 'long-term check' plan
then
they move directly to the final evaluation phase

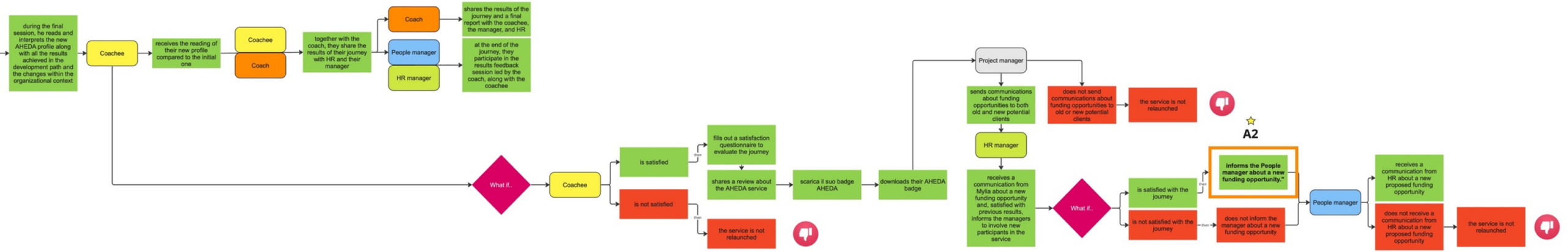


Fig. 39. *MADM flow*

Crucial Decisions for the success of the service

In this MADM flow (**Fig. 39**), there are several crucial decisions that play a pivotal role in ensuring a smooth transition from one stage of the service to the next, while maintaining the integrity and progression of the flow. These decisions can be categorized as autonomous or multi-actor and are instrumental in facilitating the successful implementation of the service delivery.

- *Autonomous crucial decisions***:** in this modeled decision process, only two autonomous decisions have emerged. Both decisions are made by the HR manager:
    - HR's decision to proceed with the purchase of the AHEDA service (**A1 in Fig. 39**): this decision has great significance because it demonstrates HR's responsibility in initiating the service delivery flow. This decision presupposes recognition of the value and potential benefits associated with the service and is dependent on the success of SOC interventions. Indeed, only if organizational actors such as Account managers, Designers, and Project Managers perform well and effectively convey the value proposition during the sales stage, HR can assess whether the AHEDA service aligns with the company's needs.
    - HR's communication to the people manager of a new funding opportunity (**A2 in Fig. 39**): this decision highlights HR's role in

re-launching the service, thus becoming a key player in the success of the service, albeit not the direct beneficiary of AHEDA. This decision can be influenced by the degree of trust that the HR manager has built with the AHEDA service.

- *Multi-actor crucial decisions:* multi-actor decisions, as the term suggests, refer to decisions that involve multiple actors in the DM process. They can be identified in the flow diagram as they bring together several actors on the same vertical level in relation to a specific decision. These actors collaborate and interact with each other to make decisions regarding the development path, demonstrating their interdependence. In the provided diagram, the following specific multi-actor crucial decisions can be observed:
    - HR manager, people manager, coach and coachee's negotiation of the project's purpose (**M1 in Fig. 39**): their active participation during the crucial negotiation phase helps align the project purpose both with the coachee's expectations and the corporate strategy. During this phase, designers from Mylia play an important role of mediation.
    - Coach and coachee's selection of the development path (**M2 in Fig. 39**): their decision to carefully select the profile that aligns better with the coachee's development goals allows for a tailored approach, enhancing the effectiveness and the satisfaction level

of the coaching process. Through this negotiation phase, the coach empowers the awareness and commitment of the coachee during the development path.

- HR and people manager agreement and acceptance of the proposed development path (**M3 in Fig. 39**): consensus between HR and people manager regarding the proposed development plan fosters a shared understanding and commitment to its successful implementation. This collective decision ensures that all stakeholders are aligned and actively support the development path.
- HR and people manager decision to extend and finance the extension of the development path (**M4 in Fig. 39**): this joint decision reflects their dedication to supporting the development process by providing the coachee with a long-term monitoring experience. It demonstrates their commitment to continuous improvement and ongoing support for the coachee's growth.

These crucial decisions form the backbone of the MADM flow, enabling a seamless progression through each stage of the service and preserving its integrity and success. They highlight the importance of informed DM, collaboration, and shared commitment to achieve the desired outcomes, empowering the various actors in their DM roles within the service life flow.

This MADM flow allowed us to comprehend the complexity of this kind of decisions and assess how users' DM may contribute to the success or failure of the service. Moreover, this analysis helped us identify areas where design interventions may be needed and provided insights into how the MADM process can be optimized and supported to enhance the service's outcomes and users' satisfaction.

8. Data Bridging

The last stage of our research process focuses on the creation of the MADM model (**Fig. 40**; Marocco & Talamo, 2022), based on the third generation of AT (Engeström, 2001). Compared with the MADM flow, this framework provides a comprehensive and holistic component that enabled us to capture the various specificities and conditions that influence each actor's DM process, bridging users and providers, and shaping the creation of interobjectivity among them. If, indeed, in the MADM flow, the temporal component is prioritized, the MADM model emphasizes the holistic dimension of the system. This framework, created on the basis of the emerging SDT tools, emphasizes the understanding of activities, made by subjects to reach their *objects*, taking into account their communities, their rules and division of labor. The MADM model proved to be instrumental in tackling another challenge that emerged during the research: the ability to provide a holistic and systemic view of the results generated from the SDT process to the provider organization, without neglecting the analytical aspect and the specific user requirements.

Below we provide detailed instructions to integrate the different components of a single activity diagram, starting from the specific SDT tools used during the previous research stage (Marocco et al., 2023a).

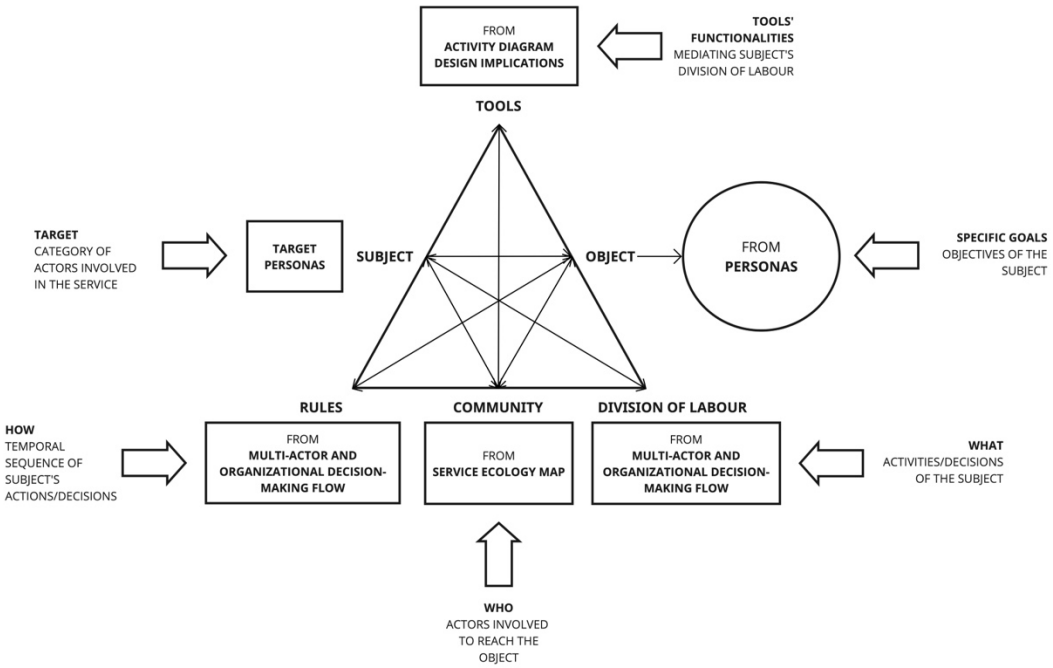


Fig. 40. *Instructions to convert Service Design Thinking tools into Activity Systems components*

As depicted in **Figure 40**, the Activity System components can be effectively interpreted within the service framework. It is crucial to emphasize that the diagram illustrates the specific roles and interactions of these activity systems during a particular MADM scenario, illustrating their composition, how their respective needs are addressed through the new service and how interdependence influences the achievement of their goals.

Specifically, activity systems components can be derived from the following SDT tools:

- The *subject* component is derived from the target *Personas* and represents the category of actors involved in the service.

- The *object* component represents the horizon towards which the specific objectives of the *Personas* are orientated.
- The *division of labor*, or the *"what"*, encapsulates the interdependent activities and decisions undertaken by the subjects, drawing insights from the *MADM flow*.
- The *rules*, or the *"how"*, originate from the *MADM flow* and from the *Organizational DM flow*, delineating the temporal sequence of actions and decisions made by the subjects, both from the users and provider organization perspective.
- The *community*, or the *"who"*, is extracted from the *Service Ecology Map*, spotlighting the diverse actors engaged in achieving the subjects' objectives.
- The *tools* component, extracted from the analysis of the *Activity Diagram*, encompasses the functionalities of the new tool and service that mediates the division of labor of the subjects and their community, addressing the specific goals directed towards the object.

This conversion must be carried out for all the actors involved in the MADM process, encompassing both the users of the DSS and the organization providing the service. In this manner, these distinct activity systems will be then consolidated into the unified MADM model.

8.1 From Design Thinking to Activity Systems: the creation of the MADM model

We show below the results of this data bridging activity, starting from the five individual activity systems emerged from the SDT process - which include the provider organization and the other four categories of actors selected -, and ending with the MADM model related to AHEDA case study. The AHEDA MADM Model encompasses the five interconnected activity systems related to organizational development. For each of the activity systems, the various components, such as rules, tools, division of labor, community, objects, are described in detail. However, for the MADM model, a higher-level analysis was conducted, capturing the interdependence of their relationships. In fact, these activity systems interact with varying levels of interdependence, reflecting the role of each activity system on the success of others' objectives and on the achievement of the shared object.

Moreover, the MADM Model represents a scenario in which AHEDA, with its features, has already been designed and implemented, to show how its functionalities serve the subjects' goals or facilitate their division of labor. This analysis also shows the importance of human input in technological services and the specific role of technology in the overall process.

8.1.1 The Role of Interdependence in the MADM Model

As previously mentioned, in order to thoroughly analyze MADM across activity systems, we believe it is crucial to consider another fundamental

concept: *interdependence*. The concept of interdependence refers to the connection between an individual's experiences, actions, and outcomes and those of other members within a group or a community. This concept was initially introduced by Lewin in 1948, who argued that groups form not necessarily due to similarities among members, but rather when individuals realize that their fate is dependent on the collective destiny of the group. This type of interdependence is called *"interdependence of fate"*. However, according to Lewin and subsequent authors, *"task interdependence"* is even more important for collective processes. This refers to the degree to which the goals of group members are interdependent, meaning that the success of one individual directly impacts the success of others or is even necessary for others to succeed (Lewin, 1948; Brown, 1990). According to us, the concept of interdependence can also be translated into the MADM model to describe the relations between multiple activity systems. Indeed, interdependence can be determined by the implications that one actor's decisions have on the achievement of others' objectives. The higher the level of interdependence among activity systems, the greater the decisions' implications by one subject have on the success or failure of others' objectives.

8.2 Results

8.2.1 Individual Activity Systems

8.2.1.1 Activity System of Mylia (**Fig. 41**)

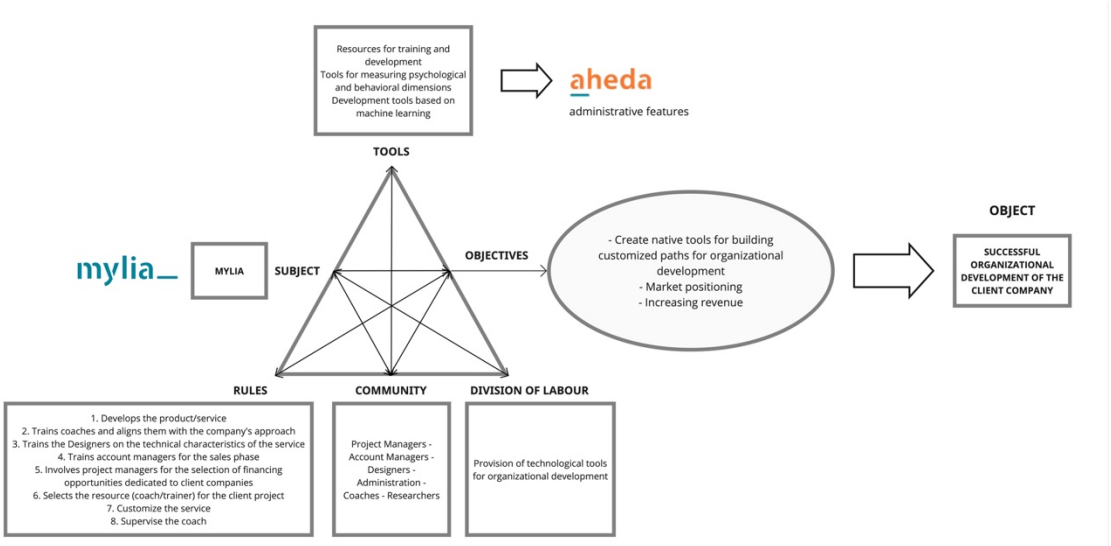


Fig. 41. *Activity System of Mylia*

The main *objectives* of MYLIA, as the provider organization, are directed to create customized tools for organizational development, enhance market positioning, and increase revenue. Based on these objectives, the *object* that MYLIA corresponds to achieving is the successful organizational development of the client company. The attainment of the object is supported by a *division of labor* in which MYLIA provides technological tools for organizational development, that is the main mission of Mylia organization. The outlined *rules* specify the temporal sequence of actions necessary to

achieve the objectives, starting with the development of the product/service and progressing to the training of coaches and designers, preparing account managers for the sales phase, involving project managers for the selection of financing opportunities, selecting the resource (coach) for the client project, following all the customization phase of the service, and finally supervise the initial work of the Coach. These activities involve a *community* of actors, including Project Managers, Account Managers, Designers, Administration, Coaches, and Researchers. Mylia's *tools* encompass resources for training and development, tools for measuring psychological and behavioral dimensions, and machine learning-based development tools. Among these tools there is AHEDA, where internal staff have access to all the administrative features.

8.2.1.2 Activity System of The Inclusive Coach (**Fig. 42**)

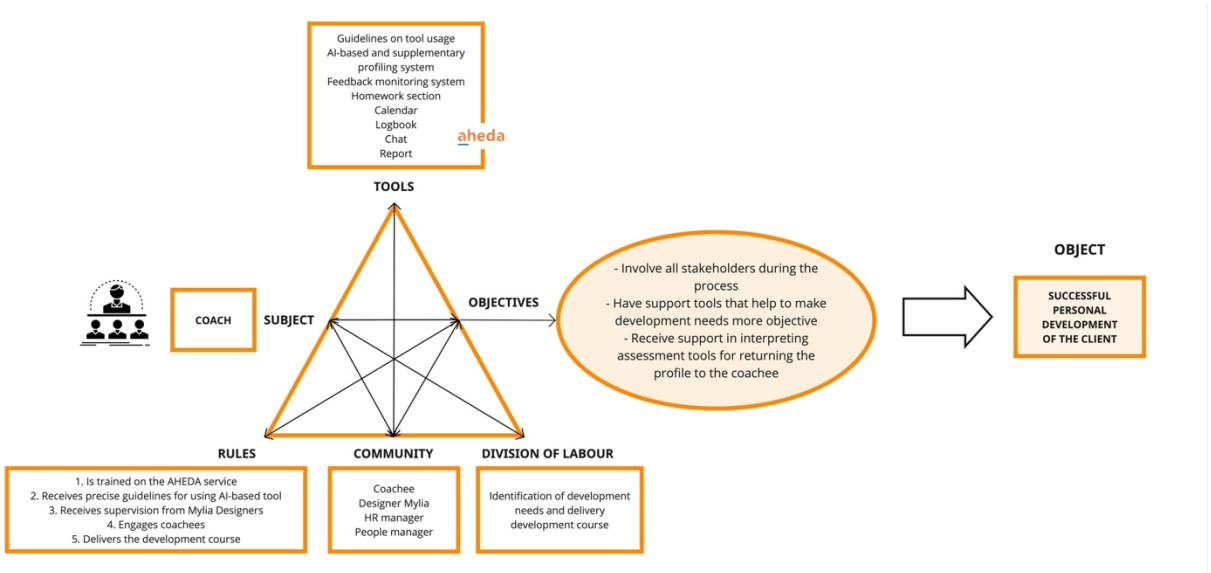


Fig. 42. *Activity System of The Included Coach*

The primary *objectives* of the INCLUSIVE COACH include involving all relevant stakeholders, using support tools to enhance the objectivity of development needs, and receiving assistance in interpreting assessment tools for the coachees' benefit. Respectively, these objectives are fulfilled through some functionalities of the AHEDA tool. Specifically, the profiling system, empowered by AI, assists coaches in acquiring an objective and holistic understanding of the coachee's development needs through a quantitative survey run through a questionnaire investigating psychological dimensions such as emotional balance, networking, influence and more. This information is further integrated by a supplementary profiling tool, derived from the SDT

process, that aids coaches in selecting the most suitable target profile and development path based on the recommendations generated by the AI system. Sample questions of the supplementary profiling system include the current role in the company, work experience duration, frequency of job changes, interests, values, motivation levels, and availability for development activities. The integration of both tools generates profiles encompassing both qualitative and quantitative aspects of the coachee. This integrated approach empowers the coach to make informed decisions when selecting the most appropriate development path for the coachee's journey. Moreover, the comprehensive manual enables him/her to correctly interpret the profiling results and provide valuable feedback to the coachee; while the feedback system plays a crucial role in fostering collaboration and shared understanding among all stakeholders involved in the development journey. The *object* of the INCLUSIVE COACH is to achieve successful personal development outcomes for clients, which signifies the effective fulfillment of its job. This is achieved through a well-defined *division of labor* that involves the identification of development needs and the delivery of a tailored development path. The *rules* regulate that the INCLUSIVE COACH first undergoes comprehensive training on the AHEDA service. Then, he receives precise guidelines for the proper utilization of the AI-based tool, which serves as a crucial asset in the development process. Subsequently, ongoing supervision and guidance from Mylia Designers contribute to his/her own

work effectiveness. The *community* involved in his/her division of labor includes Mylia Designers, and coachees, HR managers, and People managers from the client company.

8.2.1.3 Activity System of The Motivated Coachee (**Fig. 43**)

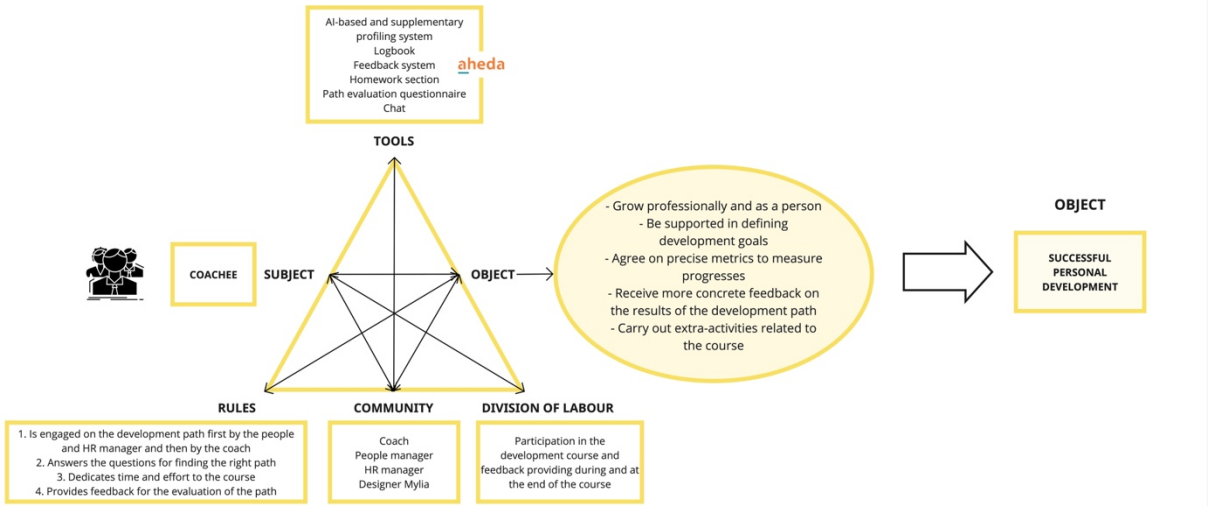


Fig. 43. *Activity System of The Motivated Coachee*

The MOTIVATED COACHEE's aspiration encompasses multiple *objectives*, including advancing professionally and personally, receiving assistance in defining development goals, collaboratively determining precise metrics for tracking progress, acquiring more concrete feedback on the outcomes of the development journey, and engaging in supplementary activities that complement the growth path. The coachee is provided with various tools' functionalities to reach his/her goals. The AI-based profiling system offers a deeper understanding of his/her professional and personal profile, guiding him/her in defining his/her development goals. The path evaluation questionnaire objectively assesses progress and identifies areas of

improvement. The feedback system ensures regular and structured measurements, enabling his/her to assess progress, and receive more concrete insights on the results of his/her development path. The homework section promotes active learning through specific tasks outside the coaching sessions. The ultimate *object* of the MOTIVATED COACHEE is to foster successful personal development, aligning with one of its core motivations. This achievement is realized through a well-defined *division of labor*, in which he/she takes part actively, providing ongoing feedback throughout the course's duration and upon its completion. Guided by specific *rules*, the MOTIVATED COACHEE operates within a specific temporal sequence of actions that includes: the initial engagement initiated by the manager, followed by continued guidance from the coach; responsiveness to essential inquiries aimed at identifying the most suitable developmental trajectory; dedication of time and effort to the prescribed course; and the contribution of valuable feedback to facilitate comprehensive path evaluation. The *community* of the MOTIVATED COACHEE includes People Managers and HR Managers from his/her organization and Coaches and Designers from Mylia.

8.2.1.4 Activity System of The Collaborative HR Manager (**Fig. 44**)

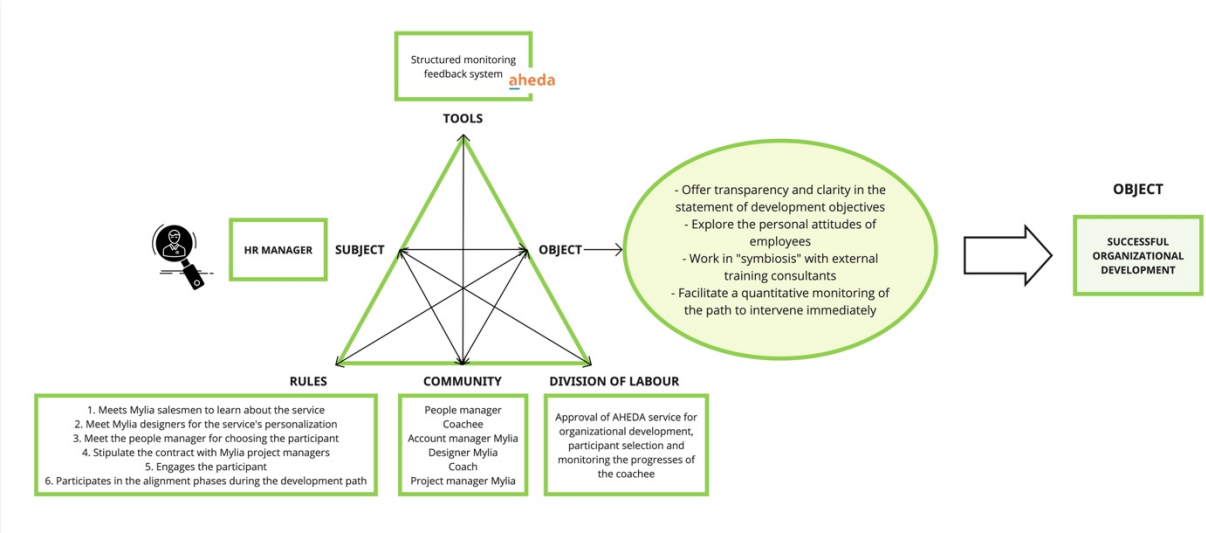


Fig. 44. *Activity System of HR Manager*

The COLLABORATIVE HR MANAGER is characterized by the following set of key *objectives*, including providing transparency and clarity in articulating development objectives, exploring employees' personal attitudes to enhance understanding, establishing a harmonious partnership with external training consultants, and enabling quantitative monitoring for immediate intervention. The main AHEDA's functionality designed to achieve the COLLABORATIVE HR MANAGER's goals is the structured monitoring feedback system. This feature allows for a systematic and quantitative evaluation of the progress, providing valuable insights for interventions and support when needed. The *object* of the COLLABORATIVE HR MANAGER

strives to achieve a successful organizational development. This requires a strategic division of labor, characterized by the approval of AHEDA service for organizational development, and the monitoring of the cochee's progress in his/her development journey. The *rules* establish this sequence of actions: first, engagement with Mylia's sales team to gain familiarity with the service, then collaborating with Mylia designers for service personalization, consulting the People manager to select the suitable participant, finalizing a contractual agreement with Mylia project managers, and actively participating in alignment phases throughout the coachee's developmental journey. The division of labor of the COLLABORATIVE HR MANAGER involves a *community* of key actors: the People Manager and the coachee from his/her organization, the coach, and the Account Manager, Designer, and Project Manager from Mylia.

8.2.1.5 Activity System of The Vigilant People Manager (**Fig. 45**)

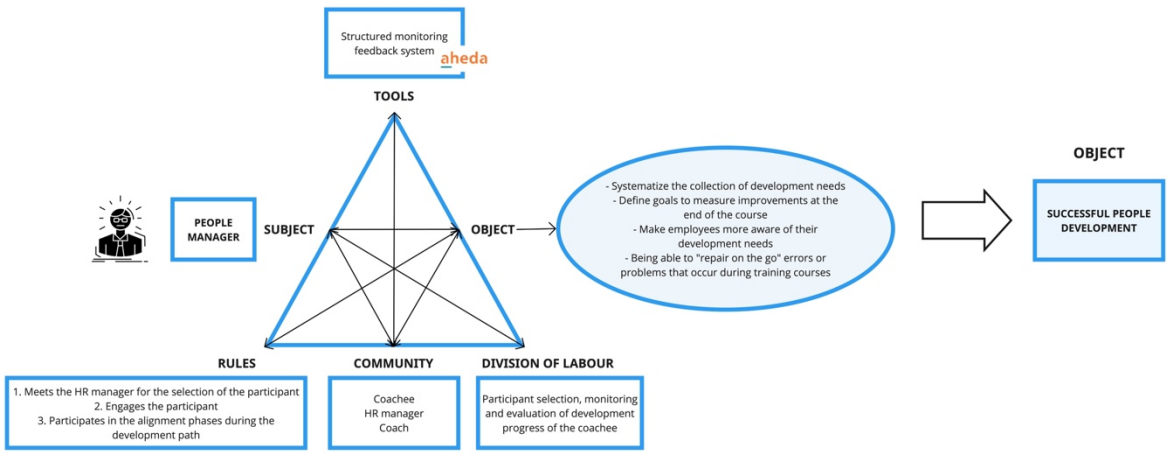


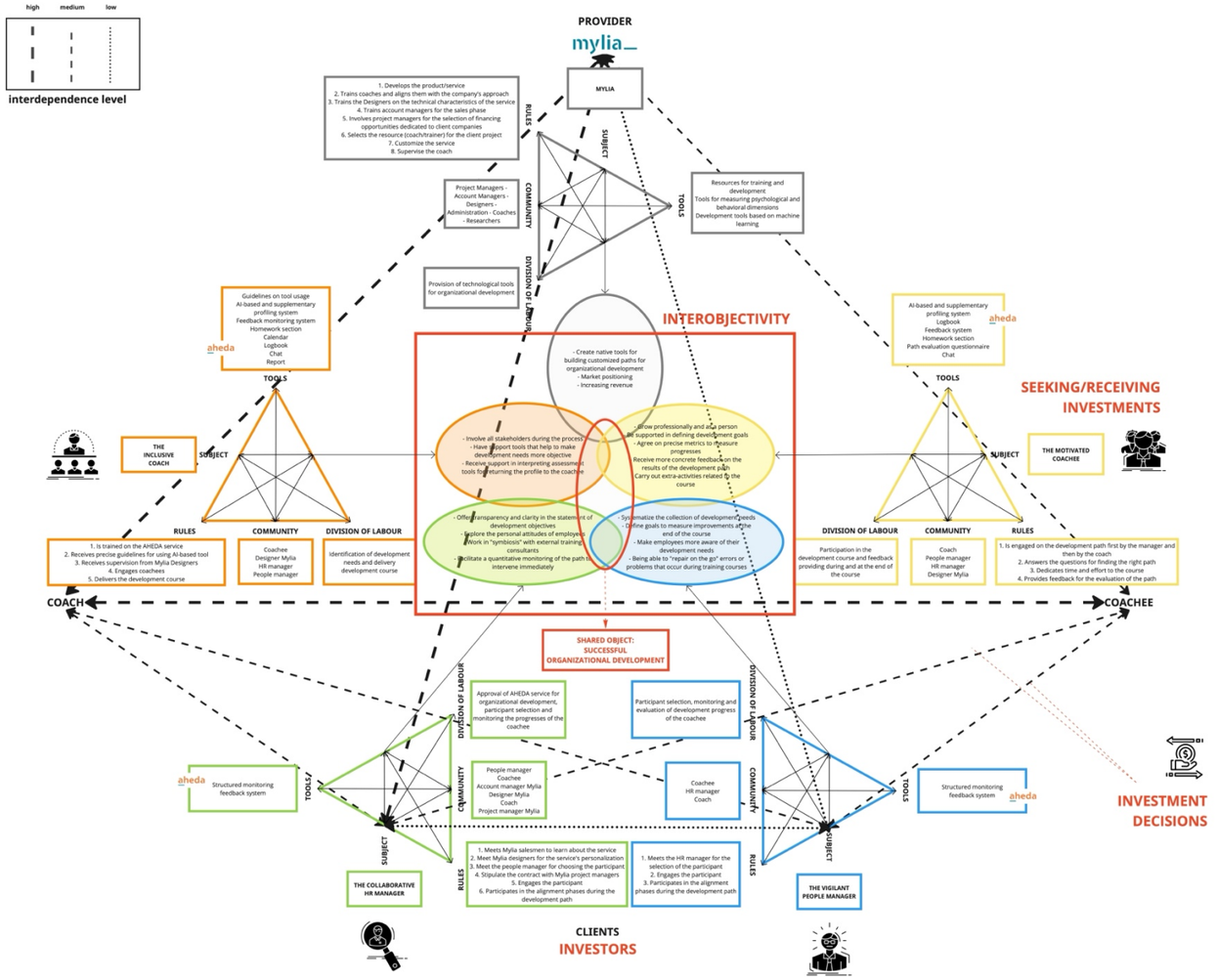
Fig. 45. *Activity System of People Manager*

The VIGILANT PEOPLE MANAGER possesses a set of clear and decisive *objectives* which are central to his/her operation, such as systematizing the aggregation of training needs, defining measurable objectives to assess post-course improvements, raising employees' awareness of their development needs, and equipping the ability to address and rectify errors or challenges encountered during the development path. To address some of his/her needs, the VIGILANT PEOPLE MANAGER uses as a specific *tool*'s functionality, the structured monitoring feedback system, which allows for organized and methodical tracking of the coachee's advancement, gathering feedback, appraising the training program's effectiveness, and enabling timely intervention when necessary. The *object* of the VIGILANT PEOPLE

MANAGER is directed to attain successful personal development, and it is guided by a strategic division of labor, including selecting participants for the development journey, and vigilantly monitoring and evaluating the coachee's progress. The guiding *rules* shaping the actions of the VIGILANT PEOPLE MANAGER are ordered as follows. The process begins with collaborative engagement alongside the HR Manager in the participant selection phase. Following this, the VIGILANT PEOPLE MANAGER actively involves the chosen participant, fostering their ongoing engagement. This engagement is maintained throughout alignment phases, ensuring continuous and active participation during the coachee's developmental journey. The key actors that constitute the *community* of the VIGILANT PEOPLE MANAGER are the coachee, the coach and the HR Manager from his/her organization.

8.2.2 AHEDA MADM Model

Fig. 46. *AHEDA MADM Model*



This model (**Fig. 46**) encompasses the five previously presented activity systems within a unified framework. These activity systems include those of Mylia (the provider organization), the coach, the coachee, the HR manager, and the People manager. These activity systems engage in mutual interaction, each stemming from distinct yet potentially aligning objectives that converge towards a shared object. This shared object, while originating from diverse motivations, ultimately finds its common ground in organizational development.

Moreover, each activity system is described in terms of specific components, highlighting the key interdependent aspects associated with each actor in the system. The model also visually depicts the connections between the various activity systems, represented by lines of varying thickness (see legend within **Fig. 45**). Connections' thickness is based on the level of decisional interdependence that occurs within the perimeter stated by the activity system's *"division of labor"* and *"rules"* on the achievement of other activity systems' *"objectives"*. Hence, the depth of these relationships can be determined by the impact that the decisions of the subjects have on achieving the goal, and how crucial this goal is for the continuation of the service. We have classified these relationships into high, medium, and low levels of interdependence:

- **High level of interdependence**: if the failure of one subject to fulfill their division of labor or to respect their rules implies the failure to achieve

the objective of another subject, resulting in the interruption or failure of the service.

- **Medium level of interdependence**: if the failure of one subject to fulfill their division of labor or to respect their rules implies the failure to achieve the objective of another subject, significantly compromising the success of the service, but still ensuring the continuation of the core focus of the service.
- **Low level of interdependence**: if the failure of one subject to fulfill their division of labor or to respect their rules implies the failure to achieve the objective of another subject, leading to user dissatisfaction but still ensuring the continuation of the service.

Below, we provide concrete examples from the AHEDA MADM model:

1. A **high level of interdependence** can be observed between the coach and Mylia. The coach, which seeks support tools to enhance the objectivity of development needs, necessitates to be trained by Mylia on AHEDA tool usage and be selected by Mylia for work projects (division of labor). At the same time, Mylia depends on coach's decision to undergo training to offer a qualified service.
2. It is also evident that Mylia has a **high level of interdependence** with the HR manager since HR's approval (division of labor) directly impacts Mylia's objective to sell the service and increase revenue. On the other hand, the HR manager's objective to facilitate a quantitative monitoring

of the development path depends on the creation and provision of Mylia's technological tool (division of labor).

3. A **high level of interdependence** is evident between the coachee, aspiring for professional and personal growth, and the coach who, as part of a division of labor, undertakes the task of identifying developmental needs and delivering developmental paths.
4. A **medium level of interdependence** can be observed between the coachee, seeking support in defining his/her development needs, and Mylia's division of labor, responsible for providing AHEDA tool, capable of profiling employees and facilitating the identification of the most suitable development paths.
5. A **medium level of interdependence** can be observed between the coach and the People and HR managers. Indeed, the coach's objective to involve all stakeholders during the process in order to work with a more self-aware coachee and to foster an attitude of receptiveness to change within the coachee's surrounding ecosystem, necessitates the active involvement of the People manager and HR manager. Their role in monitoring the coachee's progress (division of labor) and their rules to engage participants before the development journey has therefore a direct impact on the coach's objective.
6. Additionally, the coachee's objective of receiving more specific feedback on the outcomes of the development path is contingent upon the

division of labor of the HR and the people managers, who are responsible for offering feedback throughout the course and upon its completion. For this reason, this relationship is also based on a **medium level of interdependence**.

7. There exists a **low level of interdependence** between Mylia and the People Manager. In fact, the People Manager, who aims to address errors or issues that arise during development courses in real-time, relies on the functionality of the structured monitoring and feedback system provided by the Mylia tool. Nevertheless, it is primarily the responsibility of the coach and the coachee to include the People Manager's in the development path.
8. In conclusion, a **low level of interdependence** is observed between HR and the People Manager, both tasked with monitoring the coachee's progress, which aligns with their respective goals. In fact, the HR manager aims to enable quantitative monitoring of the path for immediate intervention, while the People Manager seeks the capacity to address errors or issues that arise during training courses in real-time. Nevertheless, even though the contributions of both facilitate the possibility of obtaining immediate feedback, the achievement of these objectives can also be pursued individually, albeit with lesser effectiveness.

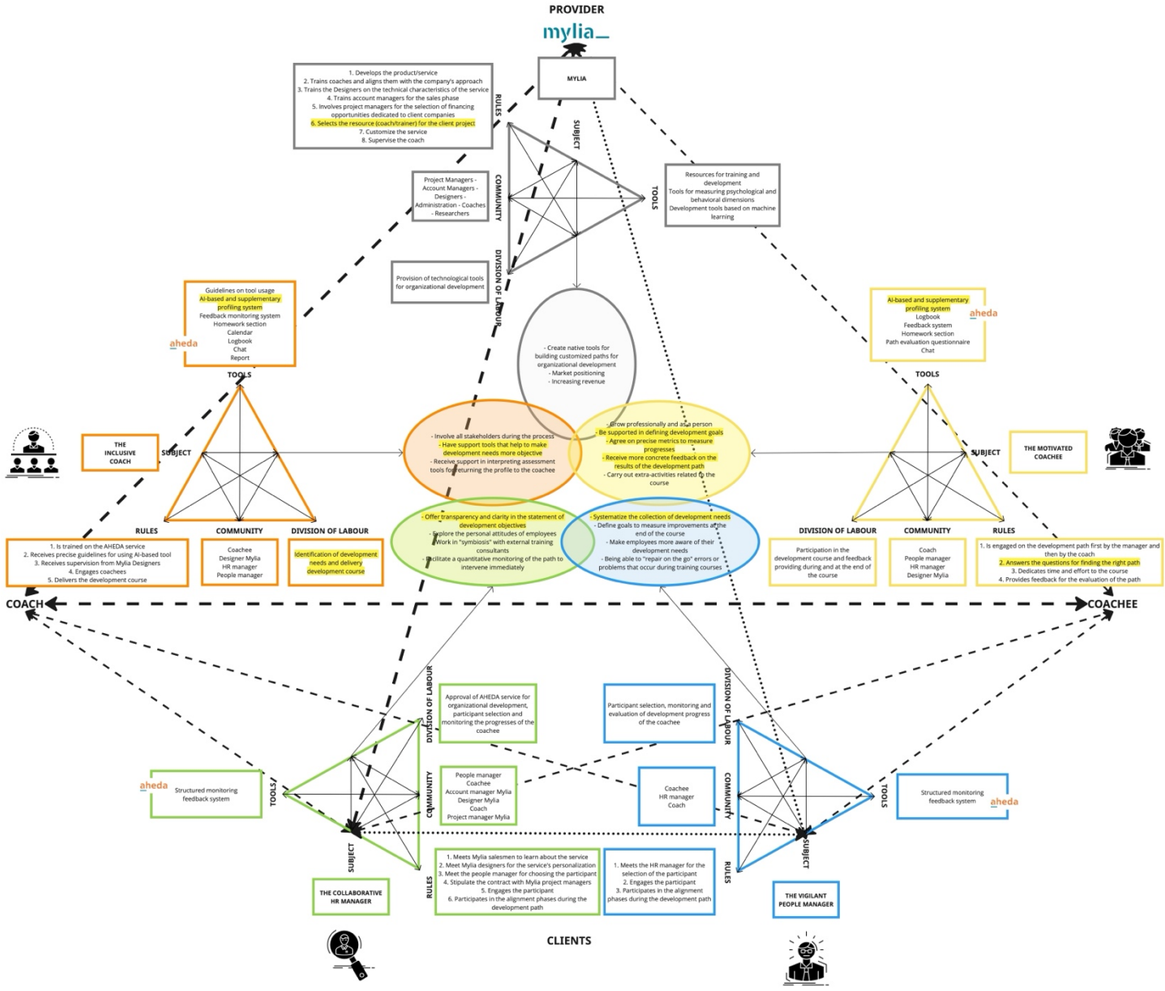
From these examples, it becomes evident that each activity system plays a crucial role in enabling others to accomplish their specific objectives. This is because some components of the activity system, the *division of labor* or *rules*, directly impact the objectives of other activity systems. This implies that each activity, directed by the subject, relies on the decision of the subject to implement it or not. This is why we refer to interdependence not only in terms of tasks but also decisions. Consequently, every decision is important as part of a single flow that enables the attainment of specific objectives and the realization of the shared object. This shared horizon - the successful organizational development - is partially shared among all the activity systems, each contributing with its own role towards the creation of interobjectivity.

Moreover, this type of analysis has allowed us to understand how crucial human contribution is for the success of a technological service. Indeed, by conducting an analysis of the MADM model, we can observe that AI-mediated activities and functionalities are in the minority compared to those not mediated by AI. Precisely the activities and functionalities (highlighted in yellow in **Fig. 47**) are aimed at:

- Identifying development needs and suggesting tailored development course;

- Offering transparency and clarity in the statement of development objectives;
- Making development needs more objective;
- Measuring progresses through precise metrics;
- Giving more concrete feedback on the results of the development path;
- Systematizing the collection of development needs;
- Selecting the most suitable resource (coach/trainer) for the client project.

Fig. 47. *The Role of AI in AHEDA MADM Model*



Consequently, we believe that, to develop a successful and user-centered AI-based system, it is essential to understand, describe, and design the entire ecosystem surrounding it. This ecosystem consists of interdependent activities and decisions between multiple actors, negotiations, communication exchanges, and steps that are not necessarily mediated by technology but still need to be defined as touchpoints for the functioning and the overall success of the service. For this reason, we propose a shift in perspective that aims to emphasize the importance of discussing AI-based services rather than just AI-based tools.

9. Discussion

According to our research objectives, we have developed a specific human-centered methodology for the design of AI-based MADSSs, addressing the specificities of organizational development - as an example of IHC. As an illustrative example, in this research project we used a real case study in the field of IHC. This case study was provided by Mylia - a brand of The Adecco Group specialized in training and development - for the design of *AHEDA*, an AI-based MADSS aimed at identifying targeted development pathways for professionals. More specifically, we focused on the individual development path (coaching) for B2B scenarios.

The methodology we developed is structured into four main stages: *data collecting, data analysis, data modeling,* and *data bridging*. Below, the research process is briefly reviewed, with a focus on the primary design implications emerging from the different stages of the process.

The **first stage** involved the exploration of the prospective users and the provider organization to gather valuable data about their needs and constraints. In particular, 16 narrative interviews were conducted to four targets of prospective users, selected as crucial within the AHEDA MADM: coaches, coachees/training participants, HR managers and People managers. On the other hand, 4 maieutic interviews were conducted to 3 members of the Design & Innovation Team of Mylia, to get insights from the provider

organization perspective. This exploration - enabled by the adoption of *User Research* and *Strategic Organizational Counseling (SOC)* - provided the collection of relevant information that served as the basis for the subsequent analysis and modeling activities.

The **second stage** was carried out through the *Thematic Analysis* approach of Braun & Clarke (2006). This approach was adopted for the analysis of the narrative interviews from *User Research* and was carried out through a *DT tool-oriented coding criteria* created ad hoc for DT methodology. Therefore, the criteria identified as guidelines for the *Thematic Analysis* were aimed at creating specific DT tools, particularly the development of the *Empathy Map* (Bland, 2016) and the *Activity Diagram* (Young, 2008). The entire coding process was supported by MAXQDA software.

The **third stage** implied the modeling of DM processes and activities specific to the prospective users and the provider organization. This comprehensive modeling approach comprises the systematization of data in a selection of SDT tools, such as *Empathy Map* (Bland, 2016), *Personas* (Osterwalder & Pigneur, 2013), *Activity Diagram* (Young, 2008), *Service Ecology Map (*Polaine et al., 2013), *MADM Flow* (Marocco et al., 2023a; Marocco et al., 2023b), *Organizational DM Flow* (Marocco et al., 2023; Marocco et al., 2023a; Marocco et al., 2023b). More specifically, from this data modeling, the following design implications have emerged.

Four *Personas,* as AHEDA's archetypal users, have been outlined:

- *Samuel*, the inclusive coach, who believes that everyone's work makes more sense when all stakeholders are on board;
- *Christine*, the motivated coachee, who actively seeks training opportunities;
- *Rose*, the collaborative HR manager, who emphasizes the importance of a supplier working in symbiosis with the company to achieve success;
- *Carl*, the vigilant manager, who takes an active role in monitoring coaches or trainers, focusing more on live feedback rather than by the use of questionnaires.

To address their needs, through the analysis of the Activity Diagram, innovation spaces have been identified, i.e., the areas of the Activity Diagram that contain activities and needs not yet satisfied by the AHEDA service originally conceptualized by Mylia. This has revealed the necessity to include the following supplementary service functionalities:

- *Supplementary Profiling:* Supplementary profiling is created to focus on the personal and professional history of participants, assisting coaches and trainers in selecting appropriate target profiles and paths based on the AHEDA psychological questionnaire and AI-based recommendations.

- *In-Progress Feedback:* Feedback is structured to collect midway through the program from coachees, coaches, HR and People managers to ensure alignment and make course corrections and improvements.
- *Structured and Multi-perspective Report:* A structured report is created at the end of the development/training journey, including feedback from coachees/participants, coaches, trainers, and People managers.
- *Long-Term Check Journey:* An option is introduced for an extended development program (six months) to assess changes in soft skills. The *"Long-term check journey"* provides online stimuli to coachees, and the measurements of outcomes after six months to gain insights into soft skill development.
- *Calendar System:* Detailed scheduling from the beginning of the course is provided. Coaches will be able to access a calendar that displays pre-scheduled appointments with participants. Reminders will be included for coach confirmation after each session.
- *Internal Chat:* An internal chat feature within AHEDA MADSS is introduced to allow seamless communication between coaches/trainers, and participants without detaching from the Mylia brand.
- *LogBook:* A logbook is provided to record activities and topics discussed during each session, making it easily shareable. This logbook is shared

with HR and People managers to better track and document the coaching/training journey.

- *Homework Section:* A dedicated section for homework is introduced, where coaches can assign supplementary activities to help participants grow in their development areas. Reminders will be sent to ensure assignments are completed.
- *Reviews & Coach Selection Recommendation System:* Coachees will provide reviews of coaches, of their intervention, and of the AHEDA service at the end of the program. These reviews will help evaluate the program's effectiveness and inform future improvements. The data also will aid AI recommendations for selecting professionals with similar characteristics.
- *Certification Badge:* A certification badge is introduced to recognize the accomplishment of goals in the AHEDA program. Coachees can download the badge and share it on LinkedIn to promote the service and achieve a sense of personal fulfillment.

Moreover, from the modeling of the SOC, the *Organizational DM flow* has emerged. This flowchart illustrates how DM processes, connected to different professional families and actors within the provider organization, such as account managers, designers, coaches, or project managers, must be managed to ensure the service's success.

The **final stage** involved bridging the users and the provider not only aligning their respective activities and DM processes but offering a comprehensive and holistic framework to capture all the specificities - namely their *rules, tools, division of labor, community, objectives, and objects* - that influence each actor's DM process and impacts the creation of interobjectivity among the decision-makers. This stage culminates in the creation of the MADM model, structured starting from the third generation of AT (Engeström, 2001). This model, considered the principal outcome of my research project, describes the social context in which AHEDA will be implemented, defining the interactions and relationships among the different actors. This socially contextualized approach offers an in-depth analysis of the environment in which the tool will be introduced for mediating already established social practices. Moreover, it highlights the way technological functionalities are tailored to address the unique requirements of each actor within AHEDA service context, highlighting how technology is intentionally designed to serve the needs of its users, and reinforcing its role as a tool in support of human endeavors, instead of substitution. Additionally, this kind of analysis provides crucial insights into the importance of human contribution in designing technological systems. From this model, it is evident that AI is not a comprehensive solution but rather addresses specific tasks or functions within the broader context of the service. Indeed, AI is integrated as a component within the service, providing functionalities that assist and enhance certain aspects of human

activity. Hence, while AI can automate specific tasks, it does not operate in isolation; rather it is integrated into a system heavily influenced by human action. This ecosystem comprises interdependent activities and decisions among multiple actors, negotiations, communication exchanges, and steps that are not mediated by technology but still need to be defined as touchpoints for the functioning and overall success of the service. Therefore, trust in such AI-based systems is not solely based on the components of AI but on the overall reliability of the entire service. In this perspective, users place their trust in the service as a whole, including how AI is integrated, how it interacts with human users, and how effectively the service supports the achievement of their specific goals and objectives.

In conclusion, the creation of a MADM model showed that, to achieve effective results in the design of complex IT systems that use AI in DM, technology development, albeit providing an enormous contribution, cannot disregard a deep comprehension of real practices by human actors.

Conclusion

This research project represents a significant advancement in the development of a human-centered methodology for the design of Multi-Actor Decision Support Systems (MADSS) based on Artificial Intelligence (AI), moving beyond a purely technical viewpoint, and incorporating social and contextual dimensions of technological integration.

This concluding section aims to address the main research questions of the project, emphasizing the results that have established this work as a valuable advancement in both theory and methodology for Human-AI integration in the field of *Investments of Human Capital* (IHC).

1) Which kind of Decision-Making characterizes IHC?

First of all, IHC can be defined as investments in intangible assets, including an individual's knowledge, skills, and abilities (Schultz, 1961). In IHCs, the aspect of Decision-Making (DM) becomes even more critical since different actors with varying behaviors and agencies are involved. For this reason, IHC cannot be considered a one-sided investment, but a mutual investment that implies a specific process of DM, a Multi-Actor DM (MADM). In fact, this kind of DM does not involve single individuals, neither a group of decision-makers belonging to the same social context, but different actors, or groups of different actors, who start from non-coinciding objectives and that, through a

process of negotiation, should make their goals *compatible* – able to coexist -, *coordinable* – able to complement each other's -, and *convergent* – able to come closer together -, to reach a rewarding and mutual agreement. In AHEDA specific context, that represents an example of IHC within the domain of Organizational Development, at least two distinct investment decisions can be highlighted. From one perspective, the HR Manager, and the People Manager, acting as investors, face the task of deciding whether company economic resources should be allocated to support an employee's developmental journey. On the other hand, the employee, seeking personal development, reflects on whether dedicating their time and effort to a company-proposed developmental path aligns with their individual goals and motivations. In this scenario, other actors come into play, such as coaches, trainers, or designers, who influence the MADM process by proposing personalized training and development pathways with the support of AI.

2) Which is the role of AI in MADM?

Within our theoretical framework, that of Activity Theory, AI can be conceived as a mediation tool between human subjects and the objects of their actions. Indeed, AI may find application across diverse segments of the DM process, facilitating tasks like information gathering, analysis, criteria standardization, and even automating customer interactions (Haesevoets et al., 2021). However, it's crucial to underscore that AI is fundamentally a tool

devised, designed, and employed by humans. Therefore, even if AI possesses agency, according to Kaptelinin and Nardi's classification (2006), it detains only a kind of *delegated agency*. In fact, while AI may appear to act upon intentions, it is important to recognize that these intentions are essentially delegated to it by external entities (human beings). This supports the undisputed primacy of humans in the context of human-AI integration, emphasizing the need of considering AI role as augmentation rather than substitution.

Also, AHEDA case study illustrates how the role played by AI is specific and supportive of integrating the *shared object* of all the actors involved, whether they are directly active on the platform, such as the coach and coachee, or indirectly represented in it, such as HR managers and People Managers. From AHEDA MADM Model, indeed, it is evident that AI is not a comprehensive solution but rather addresses specific tasks or functions within the broader context of the service, assisting and enhancing certain aspects of human activity. Hence, AI is integrated into a system heavily influenced by human action, that comprises interdependent activities and decisions among multiple actors, negotiations, communication exchanges, and steps that are not mediated by technology but still need to be defined as touchpoints for the functioning and overall success of the service.

Therefore, for the design of AHEDA as a MADSS, a study of the integration of activity systems was conducted, contributing to a promising area of study for Social Psychology applied to the development of DSSs.

3) **How can AI be accepted by managers in the context of Organizational DM?**

The systematic literature review has unveiled fundamental implications that can serve as guiding principles for the design of AI-based systems in order to be accepted by managers for organizational DM. First of all, Haesevoets et al. (2021) shed light on how human managers view machine involvement in DM. While managers tend to resist a scenario where machines take the primary role, the study also highlighted that they are open to machine participation as long as machines provide less input than humans. For this reason, organizations should incorporate AI as an advisory and support tool with the prevalence of human power and control.

From the results of User Research, it emerged that both the HR manager and the People manager *Personas* exhibit an attitude towards AI characterized as *"open with reserve"*, meaning a generally positive attitude with some reservations. In fact, both Personas agree on the importance of preserving human input for complex decisions or activities that involve interpersonal relationships. This finding is consistent with what emerges from the systematic literature review, particularly the need to maintain greater decisional control over complex managerial decisions with respect to AI.

Therefore, to promote AI acceptance of managers, who play a significant role in the purchase and selection of the service, AHEDA's functionalities designed for managers primarily provide substantial support for a secondary DM within AHEDA service. This DM involves assessing and monitoring the impact of the development path using AI-based objective tools, a solution that responds to the objectives of both managers as highlighted in the MADM Model. Moreover, AI does not favor the replacement of the crucial AHEDA DM (i.e., determining which areas the coach should make progress in), but offers recommendations that will be subject to negotiation among the coach, the coachee, and People and HR managers.

This leaves the major DM power for complex organizational decisions in the hands of humans, with AI providing support and not substituting managers in any final and strategical choices.

4) **Which Psychological Theory better contributes to the study of MADM and to the design of AI-based MADSS in the field of IHC?**

From the literature analysis, we have identified the specificities of the IHC field, recognizing its complexity as a multilayer process. This complexity demanded an inclusive theoretical framework capable of modeling the DM behaviors of all the actors involved in the decision process. While Cognitive Psychology investigates individual and intrapsychic processes, and Social Psychology, particularly the branch of Social-Cognition, examines social

influence and group biases, Socio-Cultural Psychology, and more specifically Activity Theory (AT), shifts the focus of analysis from the individual or the group to the *"activity"* itself. In particular, due to its interactive and multi-voice nature, we considered the third generation of AT (Engeström, 2001) as the most suitable model to explain the MADM construct, since it addresses the challenge of developing *"conceptual tools to understand dialogue, multiple perspectives, and networks of interacting activity systems"* (Engeström, 2001, p. 135).

Furthermore, in the final phase of this research process, the third generation of AT has been employed to develop the MADM model, a comprehensive and systemic tool derived from the outcomes of the entire Service Design Thinking (SDT) process. This framework was created using the emerging SDT tools, emphasizing the significance of comprehending the activities individuals undertake to achieve their objectives and capturing all the specificities - namely their *rules, tools, division of labor, community, objectives, and objects* - that influence each actor's DM process and impacts the creation of interobjectivity. This MADM model has proven to be essential in addressing two challenges:

1. Investigating and modeling human DM before translating it into technological design and development, guaranteeing that agency is effectively delegated to AI in accordance with the human intentions of those who will benefit from the service and that technology effectively serves users' needs.

2. Providing a holistic and systemic view of the research results generated from the SDT process to the provider organization, without neglecting the analytical aspect and the specific user requirements.

To facilitate the integration of various components within the activity systems, we have provided specific instructions. These guidelines assist in the transformation of SDT tools into elements of the MADM Model, or the activity systems in interaction.

In conclusion, this thesis strongly contributes to the advancement of theory by blending research and service design tools. This employed methodology, indeed, leverages these SDT tools to collect and structure data within a theoretical model commonly employed in the study of interactions between individuals and technology.

Limits of the Research and Future Perspectives

One of the primary limitations of this thesis was the time constraint that prevented the execution of *User Experience Testing*, which was supposed to be conducted in two phases (prototype phase - pilot study phase of AHEDA). Indeed, due to a delay in the development of the AHEDA prototype, it was not possible to incorporate this final phase of the research into my thesis.

More specifically, the execution of *User Experience Testing* aimed to evaluate:

- The quality of the User Experience through the analysis of perceived clarity, pleasantness, and utility dimensions.
- Perceptions of algorithmic qualities such as fairness, accountability, transparency, and explainability.
- The level of trust in the AI-based system.
- The User Acceptance of the AI-based system.

This quali-quantitative analysis would have allowed me to examine the interactions between the quality of the user experience, the perceived algorithmic qualities, the establishment of trust, and the acceptability of AHEDA MADSS by users, contributing to address the limited availability of studies in the field.

In light of these constraints, my intention is to further pursue this research activity, with the primary objective of providing a deeper understanding of how users interact and integrate with AI within organizational MADM processes, identifying the specific factors of the AI-based MADSS that exert a more significant influence on users' trust and acceptance.

Appendix

Interview Code	Target from User Research
SC_CO_1	Coach
FD_CO_2	Coach
AP_CO_3	Coach
FE_CO_4	Coach
LL_CE_1	Coachee/Training Participant
OC_CE_2	Coachee/Training Participant
TT_CE_3	Coachee/Training Participant
CV_CE_4	Coachee/Training Participant
GS_HR_1	HR Manager
GE_HR_2	HR Manager
LL_HR_3	HR Manager
MT_HR_4	HR Manager
CC_RE_1	People Manager
MB_RE_2	People Manager
AL_RE_3	People Manager
RB_RE_4	People Manager

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