

## Article

# The Relationship between Building Agents in the Context of Integrated Project Management: A Prospective Analysis

Alberto Cerezo-Narváez <sup>1,\*</sup> , Andrés Pastor-Fernández <sup>1</sup> , Manuel Otero-Mateo <sup>1</sup>  and Pablo Ballesteros-Pérez <sup>2</sup> 

<sup>1</sup> Department of Mechanical Engineering and Industrial Design, University of Cadiz, 11519 Puerto Real, Spain; andres.pastor@uca.es (A.P.-F.); manuel.otero@uca.es (M.O.-M.)

<sup>2</sup> Department of Engineering Projects, Universitat Politècnica de València, 46022 Valencia, Spain; pabbalpe@dpi.upv.es

\* Correspondence: alberto.cerezo@uca.es; Tel.: +34-956-483-211

**Abstract:** The increasing complexity of building projects, with high quality standards, integrated technologies and strong management restrictions, demands the intervention of numerous and diverse specialists. This requires an intense leadership, organization and coordination effort. However, building regulations, such as the Spanish Law on Building Management (LOE) 38/1999, only formally consider developers, project designers, project and work supervisors, quality control entities, construction companies, owners and final users as building agents. However, these categories are insufficient to represent the interests of all the stakeholders. The purpose of this paper is to carry out an analysis of the agents that are currently part of the entire building process. If their relationship of influence and dependence, as well as their alignment with the overall objectives of the project are studied, potential convergences, divergences, agreements and disagreements can be established. To do this, the authors conducted a prospective analysis through the MACTOR (Matrix of Alliances and Conflicts: Tactics, Objectives and Recommendations) strategic planning simulation tool, for which the rules of the Delphi technique were applied and a consultation with technical experts, both professionals and academics, was held. The research provides insight to assess the power relationships between the building agents, as well as to measure the alignment of objectives with their interests. Results show that, in the context of integrated project management (IPM), the influence of technical agents is reduced by limiting their functions to those marked by their regulatory framework, allowing them to focus on their legal powers, and the room for manoeuvre of the professional agents, who are subject to systematized monitoring and control, is also reduced. The prospective analysis also highlights the importance of defining the scope from its early stages, as well as the need to reach multilateral agreements based on the other two main constraints: time and cost.

**Keywords:** building agents; building sector; prospective analysis; strategic planning; stakeholder analysis; integrated project management



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## 1. Introduction

Despite the poor performance of construction industry projects [1], their contribution to the development of the international economy over the past 40 years has been crucial, in Africa [2], America [3], Asia [4], Europe [5] and Oceania [6]. In Spain, this industry has exemplified the intense and complex crisis the country has suffered over the period from 2008 to 2014 [7], commonly referred to as the Spanish real estate bubble [8].

The performance of construction projects is influenced by many aspects [9], both technical (limitations, constraints and assumptions, risks and opportunities, etc.) and relational (changes, stakeholders' needs and expectations, etc.). If those involved in the project state their demands at a very early stage [10], then the requirements to be considered in the project definition can be identified early on, which greatly increases the chance of the project completing successfully [11]. Acceptance or rejection of these requests may be

the first of several occasions when these interests may call into question the organizational interrelationships between agents [12].

The increasing complexity of building projects, with high quality standards [13], passive and active integrated construction technologies [14], strong restrictions on scope, quality, time and cost [15] and stringent regulations [16], is increasingly demanding that the latter be solved by numerous and diverse technicians and specialised professionals [17]. This requires their management, organization and coordination at all stages of the life cycle of the building process [18].

The construction sector is made up of a wide variety of activities [19], undertaken by a wide range of technical, managerial and professional disciplines. This involves the participation of numerous agents who must interact with each other throughout the entire process. These activities (from the design and its approval to the construction, inspection and completion of the building) must be encompassed by a regulatory framework [20]. In the majority of the countries of the European Union (EU), central authorities are involved in setting building regulations, although regional and local authorities may also be concerned [21]. In Spain, these interactions are established by organizational schemes ranging from the most traditional, governed by custom and reactively adapted by the legislation, first by the Civil Code (CC) [22] and subsequently by the LOE [23], to the most proactive, incorporating new forms of collaboration [24] that are currently challenging these regulations.

Hierarchical relationships between building agents are linked (by regulation or contract) to the life cycle phases. First, the technical project, which spans the time from the developer's initial idea until this is reflected in a document ready for implementation. During this process, regulatory aspects, selection of construction systems, economic-financial constraints, tenders, etc., arise. Next, the building work, that begins the moment the execution of the technical project is commissioned to the construction company and ends with the building being handed over to the developer. It is during this process that permits are obtained, raw materials are elaborated and supplier selection, product supply, waste management, quality control, etc., take place. This is followed by the usage stage, which is from the moment of the building being handed over until the moment it is no longer in use. This includes processes such as maintenance work. Finally, the end of life, once the building is no longer in use, a process which requires the correct disposal of the materials resulting from dismantling. This point is influenced by the regulatory framework, degree of sensitivity, etc.

In short, the undertaking of a project in the construction industry requires the participation of different and heterogeneous interdisciplinary groups, which can make the social component an element as much or even more important than the technical specifications themselves [25]. In fact, a culture of collaborative work among participants serves to achieve greater productivity [26]. In addition to the lack of definition and/or technical deficiencies that may arise throughout the project [27], the attitude of the stakeholders and their response to these problems is conditioned by their interest and commitment [28]. A lack of cooperation, trust and even communication leads to conflicts [29], hampering the performance of numerous projects in the sector. However, new forms of contract have been incorporated to improve this situation [30], promoting more stable relationships between stakeholders [31], clarifying divergences and emphasising both individual and group convergences.

This research carries out an analysis of the agents that are currently part of the building process in Spain, to evaluate their relationships, in terms of influence and dependence, as well as their alignment (opposed, neutral, indifferent or favourable) with the project's objectives. To this end, the paper is structured in the following terms: Firstly, an analysis of the legal, socio-economic and structural context of the construction sector in Spain is carried out. Secondly, the relationships between agents and their alignment with the project's objectives are studied, in the context of integrated management of the building project, for

which a prospective analysis is undertaken. Finally, the results obtained are discussed and the most important conclusions drawn.

## 2. Study Context

European Directive 85/384/EEC [32] highlights the commitment to functionality, economy, harmony and environmental balance of the building process. This regulatory framework compiles the demands of European society in relation to the quality of buildings, which affects both structural safety and fire protection along with other aspects related to the well-being of people, such as noise protection, thermal insulation or accessibility. European Directive 89/106/EEC [33] aims to remove technical barriers to trade in construction products between Member States in the EU. These directives do not intend to harmonise the European legal framework, but rather to provide a common market for construction products and services [34].

In Spain, the starting point is the simple regulation of the CC, prior to regulatory harmonisation with Europe, which only includes project designers, project and work supervisors and construction companies as parties involved, which is not sufficient to cover all situations that arise in the current context. This process ends with the arrival of the transposition laid out in the LOE.

The Spanish CC establishes the contractual obligations of parties involved in a contract, including technical projects and building works. In this context, the contracts are both for services (developers with technical experts) and construction (developers with construction companies). This primal triangular approach contrasts with the diversity of stakeholders currently participating in the complex field that encompasses the building process [35]. The CC has been supplemented by regulations related to consumer and user protection, to the land use and valuation act, and to health and safety in construction.

For instance, Royal Decree 1627/1997 [36], which transposes European Directive 92/57/EEC [37], provides for minimum health and safety measures in construction, and regulates the functions and responsibilities of the agents involved therein. This regulation recognises developers, project designers, project and work safety coordinators, project and work supervisors, construction companies, subcontractors and self-employed workers. Regarding the CC, this divides the action of specialists according to the phase of the process life cycle, incorporates subcontractors and self-employed workers, and introduces safety coordinators.

The LOE examines the roles, obligations and responsibilities of parties involved in the building process, who may occasionally have conflicting interests [38], as well as the safeguards necessary to ensure the quality of buildings and protect end-users. In the context of the LOE, the building agents are all, physical or legal entities, actively involved in the process of building and their obligations must be determined by the provisions of the LOE and the contract arising from their intervention (it can be noted that stakeholders also include those individuals and organizations whose interests may be positively or negatively affected as a result of project execution or successful project completion [39], so all the building agents are stakeholders, but not all the stakeholders are building agents).

The LOE explicitly recognizes developers, project designers, construction companies, project and work supervisors, building quality control entities, product suppliers, owners and users. However, this also implicitly recognizes consultants (topography, geotechnics and environmental impact), waste managers and insurance companies, as well as partial designers and supervisors (for the structure and facilities). In the case of project designers, safety coordinators and project and work supervisors, certain university degrees are required to be able to carry out these functions in the building process. In the LOE, these powers are reserved for architects and technical architects (quantity surveyors), as well as for different branched of engineers and technical engineers, depending on the use of the building.

Additionally, the LOE is committed to ensuring suitable acoustic conditions, energy-saving, structural and fire safety, promoting innovation and technological development

and obtaining more comfortable, safe and economical results for users, as well as being competitive and sustainable for society. For this reason, the LOE finally establishes a harmonised standard with the European Directives. This revision of the legal regulatory framework shows most of the parties involved in a building project in Spain. However, in the 20 years since the newest building regulation came into force, new agents have been incorporated or other agents that were already appearing intermittently throughout the process have been consolidated.

Among the building agents that are not explicitly included in the building regulations, the project managers must be highlighted [40], who in Spain are not assigned their own powers nor subject to specific regulation [41]. They are exclusively contracted by the developers to manage the entire building process. To achieve the agreed objectives, the activities of the project lifecycle will have to be organized. To do this, the stakeholders will need to be coordinated, including the building agents, teams must be led, available resources must be programmed according to constraints, and the risks must be controlled. In short, the project must be managed. Other noteworthy agents are [42]:

- Control entities and sponsors, such as financial institutions and insurance companies [43], as well as self-regulatory professional bodies, which in Spain are professional associations that check building requirements [44].
- Technicians, such as consultants of topographical and geotechnical studies, partial designers of technical projects (or subcontractors of project designers), interior designers, landscapers and decorators [45], as well as partial supervisors of work construction (or subcontractors of work directors).
- Managerial agents, such as site foremen [46] (who traditionally represented the contractor but are being independently incorporated as construction managers [47]) and waste managers [48] (dealing with recycling, valorisation and disposal).
- Specialised professionals [49], such as construction subcontractors.

After the publication of the LOE in 1999, the construction sector became one of the drivers of the Spanish economy [50], due to its contribution to gross domestic product (GDP), its capacity to generate jobs and the multiplying potential of other auxiliary industries, until the bursting of the real estate bubble [51], when it halved its share of national GDP from 10.41% in 2008 to 5.22% in 2014. In addition, according to data from the National Statistics Institute (INE), in these last 20 years, although productivity in civil engineering works has almost doubled (up 88.27%), in building it has barely increased by 1.74% [52].

The reality of the building sector in Spain led to the incorporation of new contracting formulas beyond the traditional contract, with the aim of optimising investment, applying technological advances and ensuring the construction and delivery. Among these organisational models, those which stand out are the project and construction (turnkey) model [53] and the IPM [41]. Other contract types less used in Spain are the accelerated construction process, the build–own–operate–transfer (BOOT) model, the engineering model and open book pricing, among others.

The traditional model is one in which, on the one hand, the developer contracts the architectural and/or engineering services to design the technical project and assume the functions and responsibilities of the supervision of the work, and, on the other hand, formalises a construction contract with the construction company for the material execution of the work and coordination of subcontractors. In this way, the whole process is divided into the celebration of two non-concurrent main contracts:

1. Between the developer and the technicians, by which they undertake to define the technical specifications of the building work and even prepare the tender, advising on the choice of the construction company, as well as supervising the execution of the building work.
2. Between the developer and the construction company, by means of which, the latter is obliged to the developer to carry out the work in accordance with the technical project. As the technical project was designed prior to the tender, this promotes competitiveness among bidders, reducing the problems of a lack of definition or

contradictions that may arise. This avoids a conflict of interest between construction companies and technicians as they are independent of one another. However, these contracts do not provide for an organisational and systematic structure that considers all stakeholders' needs and expectations, nor a system of proactive control of the developer's objectives [54], which may result in delays in delivery, cost overruns, and inability to resolve future claims [55].

The turnkey contract modifies the roles played by the agents involved [56]. This contract reduces participants in the construction process to two: developer and construction company, in a bilateral relationship, with the construction company assuming responsibility for the entire process [53] to deliver a complete, proven and ready-to-use building. Under this general obligation, the construction companies carry out the technical definition of the project, execution of the work and commissioning of the building, which implies a greater specialisation and technological contribution compared to traditional contracts.

In relation to the traditional model, the IPM contract involves the participation in the building process of a fourth agent, the project manager, who assumes functions that in the traditional model are usually partially exercised by the developer, the design team and the project and work supervisors. These management contracts involve organizations that direct, manage, plan, coordinate, supervise and control works, resulting in a reduction in the time and costs associated [57]. In the building process, the IPM advises on design, monitors quality, inspects, consults contracts and makes binding decisions with other agents, through the management of both the project and the work.

### 3. Prospective Analysis

How can the power relationships of each building agent be determined? What is this relationship between interests? Is it possible to measure these interactions? How can they be measured? How do the positions of the stakeholders within the project impact its outcome? To answer these research questions, a prospective analysis has been done. Prospective analysis is a qualitative method that is based on action and non-predetermination using specific methods for setting out a range of future scenarios [58]. This methodology includes a stakeholder analysis of the parties involved in the system to be studied. To undertake this stakeholder analysis, the MACTOR strategic planning simulation tool is used [59] because of its facilitation and systematisation capacity. This tool is designed to assess the power relationships between the project stakeholders, as well as to measure the alignment of objectives from the associated particular interests [60].

The MACTOR method seeks to gauge the balance of power between stakeholders and study their convergences and divergences when faced with a certain number of associated objectives, allowing them to determine alliances and coalitions and avoid conflicts [61]. This tool provides an analysis to predict the future behaviour of stakeholders that operate in a project: What is their position in relation to this or that problem? With whom could alliances be formed? How strong are they? How reliable are they? With whom will it be more difficult to negotiate? These are some of the major uncertainties addressed by the MACTOR tool.

This methodology has already been successfully applied in other economic sectors, such as fishery and aquaculture [62], agri-food [63], sustainable development [64], higher education [65], renewable energy [66], government [67], creative industry [68], telecommunications [69] and tourism [70], among others.

The MACTOR analysis requires a sequence of steps [71] that can be described in these three stages:

1. The building agents (parties actively involved) as well as the strategic objectives of the entire building process are identified.
2. The data are entered into the software, converting qualitative data in accordance with prescribed procedures, with which the results are obtained:
  - Identification of the strategic stakes and associated goals and of the position of each actor according to each objective.

- Pinpoint convergences and divergences.
3. The data are analysed to make recommendations or proposals to the building agents, based on their relationships and positions regarding the project objectives (for example, formulating strategic recommendations and asking key questions for the future).

As the sequence of steps progresses, MACTOR produces tables and graphs. These results obtained will provide a clearer picture of how the system actually works. However, it is necessary to define one step prior to carrying out this method: to establish the data sources which will feed the system. These data may come from content analysis, literature review, seminars, workshops, questionnaires and interviews with stakeholders or experts [72]. In this research, results will come from a panel of experts, using the Delphi technique. Identifying and selecting suitable opinion experts is crucial for the success of the research [73], becoming one of the most critical actions in the whole process [46]. Although these experts can have differentiated decision-making habits, risk preferences or knowledge backgrounds [74], the useful guidance provided by them indicates that they are confident in the field [75]. Once the process starts, the experts arrangement through the Delphi Technique allows the level of consensus and the hierarchy of its importance [76] to be determined.

### 3.1. Selection of Experts

The Delphi technique has to be executed with the participation of individuals who have knowledge and competence in the study subject, as well as a deep understanding of the problem [77]. Accordingly, to be part of the initial sample, it is necessary for the panel members to be building experts. To do this, initial requirements included having both relevant experience and deep knowledge on the subject (building life cycle, building project management, construction management, construction engineering, legal regulatory framework, real estate promotion, etc.), so academics who are or have been professionals, and professionals who are or have been academics were sought. In addition, in order to avoid bias, candidates had to meet four additional requirements:

1. Expertise, either in building project management or in construction management, or in designing technical projects or directing works. Ten years of experience are required, having participated in at least five projects of more than one million euros each. The possession of professional project management certifications is positively valued.
2. Relevant teaching experience, with at least another ten years of acknowledgement (two recognized five-year periods) in this field.
3. Pioneering research, with at least twelve years of impactful research (two recognized six-year periods) in this field.
4. Transfer experience, with at least five collaboration contracts in this field with companies for applying research findings in a specific context.

### 3.2. Identification of Agents and Strategic Objectives

Once the panel of experts is formalized, a preliminary list is extracted from the current legal framework for the identification of agents. This is distributed to the panel of experts to suggest changes and comments, indicating that the research is conducted in the context of a IPM contract comprised of the technical project and the building work. This took two rounds (after a first round in which some actors not explicitly included in the regulation were proposed and some clarifications were made) to reach an agreement. Table 1 shows this final list, including the main phases of the process in which the building agents participate. On the contrary, a preliminary list of strategic objectives is extracted from the literature review of the last two decades. This is distributed to the panel of experts to suggest new references. Although no objectives were added or removed, some references were included, as shown in Table 2. Classic managerial objectives such as cost, time, quality and scope (of work) [78–81] are joined by instrumental objectives such as health and safety

and environment [82–86] and communication [87,88], technical and professional objectives such as functionality, productivity and technical performance [89,90], and client objectives such as profitability [91,92] and customer satisfaction [93,94]. From Tables 1 and 2, both questionnaires are sent to the expert panel.

**Table 1.** List of building agents.

ID	Acronym	Reference	Note	Building Agents	P	W
A01	TC	[23]	(1)	Topographical Consultants	X	
A02	GC	[23]	(1)	Geotechnical Consultants	X	
A03	PD	[23]	(2)	Project Designers	X	
A04	SD	[42]	(1, 3)	Structural Designers	X	
A05	FD	[42]	(1, 3)	Facility Designers	X	
A06	EEC	[95]	(3, 4)	Energy Efficiency Certifiers	X	
A07	TD	[23]	(2)	Telecommunications Designers	X	
A08	IDLD	[45]	(5)	Interior Designers, Landscapers and/or Decorators	X	
A09	EIC	[23]	(1, 3)	Environmental Impact Consultants	X	
A10	HSP	[36]	(6)	Health and Safety Planners	X	
A11	UMP	[23]	(1, 3)	Use and Maintenance Planners	X	
A12	PHSC	[36]	(6)	Project Health and Safety Coordinators	X	
A13	RED	[23]	(2)	Real Estate Developers	X	X
A14	O	[23]	(2)	Owners	X	X
A15	FU	[23]	(2)	Final Users	X	X
A16	PM	[40]	(5)	Project Managers	X	X
A17	PA	[23]	(2)	Public Administrations	X	X
A18	SRPB	[96]	(7)	Self-regulatory Professional Bodies	X	X
A19	FI	[43]	(5)	Financial Institutions	X	X
A20	IC	[43]	(1, 3)	Insurance Companies	X	X
A21	QCLE	[23]	(2)	Quality Control Laboratories and Entities	X	X
A22	WM	[48]	(1, 6)	Waste Managers	X	X
A23	PS	[23]	(2)	Project Supervisors		X
A24	SS	[42]	(1, 8)	Structural Supervisors		X
A25	FS	[42]	(1, 8)	Facility Supervisors		X
A26	TS	[23]	(2)	Telecommunications Supervisors		X
A27	WS	[23]	(2)	Work Supervisors		X
A28	WHSC	[36]	(6)	Work Health and Safety Coordinators		X
A29	BC	[23]	(2)	Building Contractors		X
A30	CM	[47]	(5)	Construction Managers		X
A31	SF	[46]	(5, 9)	Site Foremen		X
A32	SSC	[49]	(6, 9)	Specialist Subcontractors		X
A33	SEW	[23]	(2, 9)	Self-employed Workers		X
A34	PS	[23]	(2, 9)	Product Suppliers		X

(1) Implicitly recognized in Spanish LOE 38/1999. (2) Explicitly recognized in Spanish LOE 38/1999. (3) Subcontracts for Project Designers. (4) Explicitly recognized in Spanish Royal Decree 235/2013. (5) Figures not included in the Spanish regulatory framework. (6) Explicitly recognized in Spanish Royal Decree 1627/1997. (7) Explicitly recognized in Spanish Royal Decree 1000/2010. (8) Subcontracts for Project Supervisors. (9) Subcontracts for Contractors. P: Technical Project. W: Building Work.

**Table 2.** List of objectives of the building process.

Decade	Source	O01	O02	O03	O04	O05	O06	O07	O08	O09	O10	O11	O12
		C	S	Q	SW	HS	E	F	P	TP	PF	CM	CS
2001–2010	[89]	X	X	X	-	X	X	X	X	X	X	-	X
	[82]	X	X	X	-	X	X	-	-	-	X	-	X
	[92]	X	X	X	-	X	X	X	-	-	X	-	X
	[87]	X	X	X	-	X	X	-	-	-	-	X	X
	[83]	X	X	X	-	-	X	-	-	-	-	-	X
	[78]	X	X	X	X	X	X	-	-	-	-	-	-
	[88]	X	X	X	X	-	-	-	-	-	-	X	-
2011–2020	[84]	X	X	X	-	X	X	-	-	-	-	-	X
	[91]	X	X	X	-	X	X	-	-	-	X	-	X
	[90]	X	X	X	-	X	X	X	X	X	-	X	X
	[93]	X	X	X	-	X	-	-	-	-	-	-	X
	[94]	X	X	X	-	X	-	-	-	-	X	-	X
	[79]	X	X	-	X	X	-	-	X	-	X	-	-
	[80]	X	X	X	X	X	-	X	-	X	X	-	X
	[81]	X	X	X	X	X	X	X	X	X	X	-	X
[85]	X	X	X	-	X	X	-	-	-	X	-	X	

Sources are shown in chronological order. C: Cost. S: Schedule. Q: Quality. SW: Scope (of Work). HS: Health and Safety. E: Environment. F: Functionality. P: Productivity. TP: Technical Performance. PF: Profitability. CM: Communication. CS: Customer Satisfaction.

### 3.3. Data Collection

In relation to the agents, following the instructions of the MACTOR tool, a hierarchical classification is carried out using the matrix of direct influences (MDI), quantifying the direct influences (DI) and dependences (DD) between agents, in accordance with a scale of 0–4: (0) if agent  $A_i$  cannot question agent  $A_j$ , (1) if agent  $A_i$  can question agent  $A_j$ 's operations (limited in scope and time), (2) if agent  $A_i$  can question the choice of agent  $A_j$ , (3) if agent  $A_i$  can question agent  $A_j$ 's roles, and (4) if agent  $A_i$  can question the existence of agent  $A_j$ .

Regarding the objectives, there is to determine the position of agents in relation to each objective, which is represented in the valued positions matrix (2MAO). To do this, first it must be determined whether the agent is favourable or unfavourable towards the objective: (+) if agent  $A_j$  is in favour of objective  $O_i$ , (–) if agent  $A_j$  is against objective  $O_i$  and (0) if agent  $A_j$  is neutral towards objective  $O_i$  (this represents the simple positions matrix (1MAO)). In second place, the intensity of the agent's position on that objective is measured: (0) if objective  $O_i$  has little or no impact, (1) if objective  $O_i$  can question (limited in scope and time) the operations of agent  $A_j$  or is essential to them, (2) if objective  $O_i$  can question the choice of agent  $A_j$  or is essential for it, (3) if objective  $O_i$  can question the performance of agent  $A_j$ 's duties or is essential for them, and (4) if objective  $O_i$  can question the existence of agent  $A_j$  or is essential for it.

Experts must consider each agent's plans, motivations, limitations and means of action. The estimations of the experts are made in successive anonymous rounds, with maximum autonomy on the part of the participants. The experts are asked to include appropriate comments to justify their answers, so that the other experts can reason this out in subsequent rounds. The consultation process ends once an agreement is reached. In order to obtain the MDI and 2MAO, this agreement is achieved through the consensus among panel members (convergence of opinions expressed) and the stability of their responses (limited variation in the responses given by the group). On the one hand, consensus is



obtained across the interquartile range (IQR), by calculating the difference between the third quartile (Q3) and the first (Q1), with a variation equal to or less than 0.5 being accepted [97]. On the other hand, stability is calculated using the relative interquartile range (RIR), which results from dividing the IQR by the second quartile (Q2), and is accepted if the variation is less than 0.3 [98]. It can be noted that the values entered in MACTOR represent the median (Q2) for each cell value, once it is verified that both the IQR and RIR do not exceed the maximum permitted values for each row  $i$  and column  $j$ . Then, the software subsequently evaluates the power relationships between them.

### 3.4. Relationships between Agents

If the influences that each agent has on the others are added together, without considering the indirect self-influences, the matrix of direct and indirect influences (MDII) is obtained, which shows the direct and indirect influences and dependences (II, ID) of second order between agents [60]. Next, using the MDVI, the competitiveness relationship ( $R_i$ ) between agents is also determined, considering both influences and dependences and their retroaction. These relationships ascend as their influence increases (and/or their dependence decreases) and vice versa, anticipating the pre-eminence of one agent over another. Then, the net scale (NS) of influences is determined, measuring for each pair of agents the distance between DI and II, indicating for each pair of agents the surplus influence exerted or received (which translates into the most and least influential agents). After that, the influence-dependence graph between agents is obtained. This graph shows the degree of dependence on the  $X$ -axis and the impact of influence on the  $Y$ -axis. Thus, agents are classified into four types: dominant (very influential, not very dependent), intermediary (influential, but also dependent), autonomous (not very influential and independent) and dominated (not very influential, very dependent). Finally, the maximum level of influence that an agent can exert on another agent, directly or through a intermediary agent, is identified, and the matrix of maximum direct and indirect influences (MMDII) is obtained. From the MMDII, the maximum competitiveness ratios ( $Q_i$ ) are determined, summarizing in a single value the degrees of maximum influence and dependence of each agent, giving a measure of their real relationships [99]. This process is summarized in Figure 1:

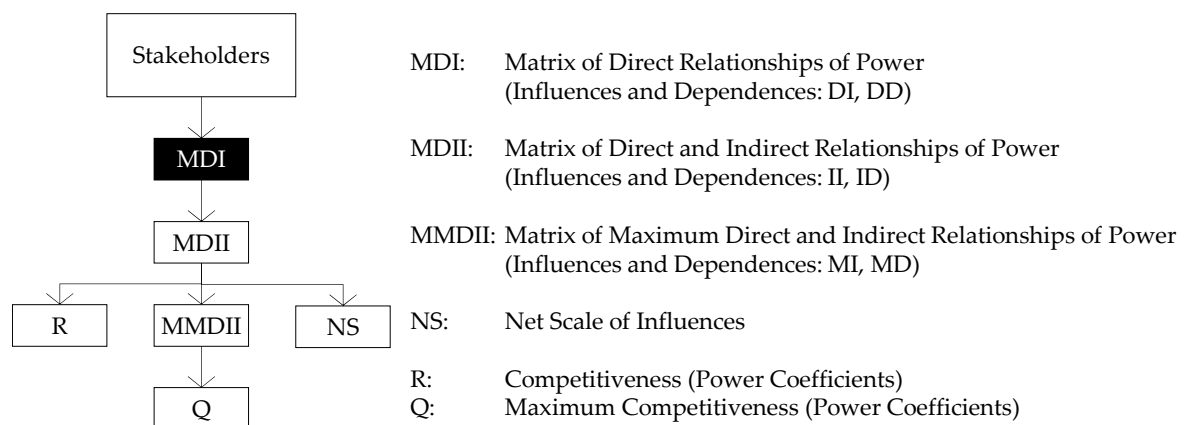


Figure 1. MACTOR stages from Stakeholders Relationships of Power.

### 3.5. Alignment of Agents and Objectives

The 2MAO matrix quantifies the agents' positions on the objectives. From this, the simple position matrix (1MAO) is obtained, focused on the agents' assessments, indicating each agent's position on each objective (for, against or neutral). If the values of the MIDI and the 2MAO are combined, the valued weighted positions matrix is obtained (3MAO), which considers the degree of opinion of each agent on each objective, hierarchy and competitiveness. Positive values represent the acquiescence of agents in achieving their objectives and negative ones represent their opposition to achieving them. Each of the

three matrices provides the number of agreements (OK) and disagreements (KO) of the agents with the objectives and the convergences (CV) and divergences (DV) between agents, as well as their mobilisation (MB). Once these matrices are calculated, the net distances between agents can be obtained, which allows potential alliances to be recognized, as well as the net distances between objectives. The conjunction of these two allows shared and contrary positions to be determined according to agent and objective, enabling these common agreements to be worked on [99]. This process is summarized in Figure 2:

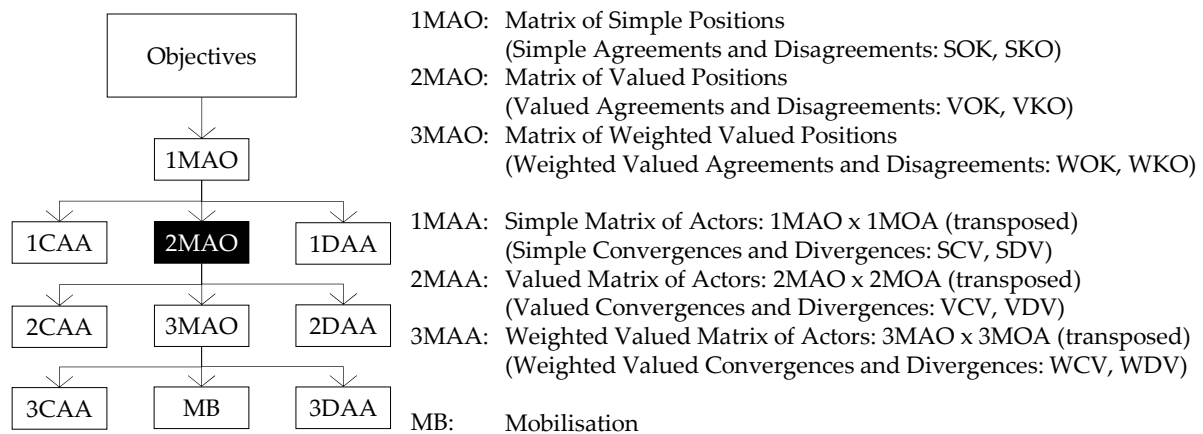


Figure 2. MACTOR stages from Objectives Positions.

#### 4. Results

A total of eighteen respondents finally participated from 15/04/2020 to 14/10/2020, after accepting the proposal for participation and meeting the requirements established to be considered experts. The invited group of experts came from six areas of knowledge (Architectural Buildings, Administrative Law, Civil Law, Construction Engineering, Architectural Projects and Engineering Projects) from eight Spanish universities, accumulating an average of forty-one building projects (from six to one hundred and thirty-nine projects), five five-year periods of teaching experience and four six-year periods of research (from thirteen to forty-seven years), and sixteen transfer contracts (from five to thirty-six), as is shown in Table 3. In summary, the experts have extensive experience in building-related research and teaching, as well as active participation in numerous construction projects, demonstrating their expertise in the generation, dissemination and transfer of knowledge in the field. Once the group of experts was obtained, they proceeded to weigh the direct relationships between agents (getting the MDI) and of these agents with the general objectives of the project (getting the 2MAO). To this end, they are provided with the final list of the building agents and the overall objectives, so that these can be assessed, according to the scales defined. In the case of stakeholders' relationships of power, the experts reached an agreement after the third round in the MDI (with an IQR of 0.42 and a RIR of 0.24). In the case of the position of stakeholders with regard to the project objectives, the experts reached an agreement in the fourth round in the 2MAO (with an IQR of 0.48 and a RIR of 0.28). The resulting final matrices are shown in Tables 4 and 5.

Table 3. Panel of experts.

University	Knowledge Area	Academic Roles	Professional Roles	Academic Years	Professional Years	Transfer Contracts	Building Projects
Cadiz	125	Associate Professor	Urbanism Consultant	21	13	8	7
Cordoba	510	Full Professor	Environmental Manager	43	24	23	7
Granada	110	Associate Professor	Technical Director	15	17	7	37
	130	Full Professor	Contract Auditor	39	18	5	6
	715	Full Professor	Technical Director	20	24	31	42
	720	Full Professor	Construction Manager	20	10	30	8
Jaen	720	Associate Professor	Operations Manager	34	12	8	27
Malaga	715	Adjunct Professor	Technical Director	13	19	6	41
	720	Associate Professor	Facilities Specialist	30	12	15	18
Polytechnic of Madrid	110	Full Professor	Structures Specialist	47	16	26	40
	720	Full Professor	Program Manager	32	23	20	60
Polytechnic of Valencia	110	Associate Professor	Project Manager	21	42	6	139
	715	Adjunct Professor	Technical Director	14	19	36	96
	720	Associate Professor	Property Developer	21	15	12	15
Seville	110	Full Professor	Quality Controller	28	40	10	41
	130	Adjunct Professor	Property Advisor	23	35	6	24
	715	Full Professor	Technical Director	27	25	28	70
	715	Associate Professor	Technical Director	13	21	5	52

Knowledge Areas of the Council of Universities of Spain: 110: Architectural Constructions. 125: Administrative Law. 130: Civil Law. 510: Construction Engineering. 715: Architectural Projects. 720: Engineering Projects.

After consensus and stability were achieved in the expert panel consultation, the matrices' data (MDI, 2MAO) were loaded into the MACTOR software (version 5.1.2). Through this tool, the results processed were subsequently analysed, establishing hierarchies of the relationships between the agents, as well as the relationships of the agents with the project objectives. This information is of great relevance, since from it the prospective analysis of building agents is generated.

Table 6 summarizes both direct, indirect and maximum influences and dependences between agents: DI, DD, II, ID, MI, MD. Directly, the great influence wielded by project managers with 53 points (as managerial leaders during the whole process), the public administrations and the professional associations with 17 points (as controllers of legal and technical requirements), project designers with 26 points (as technical leaders during the technical project) and project and work supervisors with 16 points (as technical leaders during the building work) can be highlighted. However, if indirect influences are also considered, although project managers remain the most influential agents (with 226), project designers (with 102) and project and work supervisors (with 125) lose their position to public administrations (with 157) and professional boards (with 128). If maximum influences are considered, project managers (with 75), project designers (with 36), public administrations (with 32) and project and work supervisors (with 30) must be stressed. In terms of dependence, the position of professional associations, project designers and construction companies stand out, both in direct and indirect terms. The entire MDII and MMDII matrices are shown in Tables A1 and A3 (see Appendix A).

**Table 4.** Matrix of Direct Influences (MDI). Data input for MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34		
A01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
A02	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A03	1	1	4	4	4	1	1	1	1	4	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A04	0	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A05	0	0	1	0	1	0	0	1	1	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A06	0	0	1	0	1	0	0	1	1	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A07	0	0	1	0	1	0	0	1	1	1	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A08	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A09	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A10	0	0	1	1	1	0	1	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A11	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A12	0	0	1	1	1	1	1	0	1	1	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A13	0	0	0	0	0	0	0	0	0	0	0	0	2	1	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A14	0	0	0	0	0	0	0	0	0	0	0	1	4	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A16	3	3	2	0	0	2	2	4	2	2	2	2	0	1	0	0	0	0	3	3	3	2	0	0	2	2	2	3	4	0	0	0	0	4	4	
A17	0	1	1	0	0	1	1	0	1	1	1	1	1	0	0	0	1	0	1	0	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	
A18	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	
A19	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A20	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A21	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
A22	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	
A23	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4	4	1	1	1	1	1	0	0	0	0	1	1		
A24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	1	1		

Table 4. Cont.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
A25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	1	1	1	1	0	0	0	1	1	
A26	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	1	1	1	1	0	0	0	1	1	
A27	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	
A28	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	
A29	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	4	3	3	
A30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	1	1
A31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0		
A32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
A33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1		
A34	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1		

Influences are graded from 0 to 4 according to the importance of the actor's jeopardy: 0: No influence. 1: Operating procedure. 2: Choice. 3: Functions. 4: Existence.

**Table 5.** Matrix of Actors × Objectives (2MAO). Data input for MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
O01	-2	-2	-2	-4	-4	-2	-2	-4	-2	-2	-2	-2	1	2	2	-3	0	0	3	3	-1	-2	-2	-4	-4	-2	-2	-2	-3	-4	-4	-4	-4	-2
O02	-2	-2	-2	-4	-4	-2	-2	-4	-2	-2	-2	-2	1	2	2	-3	0	0	1	2	-1	-2	-2	-4	-4	-2	-2	-2	-3	-4	-4	-4	-4	-2
O03	3	3	3	4	4	2	2	4	2	2	2	2	1	1	2	3	0	0	0	3	3	2	3	4	4	2	2	2	3	4	4	4	4	4
O04	4	4	3	4	4	4	4	4	4	3	4	4	1	1	2	3	0	0	0	3	3	4	2	4	4	4	2	2	3	4	4	4	4	4
O05	1	1	1	1	1	1	1	1	3	1	1	1	1	0	0	1	0	0	0	3	3	3	1	1	1	1	1	3	3	3	3	1	1	1
O06	1	1	1	1	1	1	1	1	3	3	1	3	1	0	0	1	0	0	0	3	3	3	1	1	1	1	1	1	3	3	3	1	1	1
O07	1	1	3	1	1	1	1	4	1	1	3	1	1	1	2	1	0	0	0	0	0	0	3	1	1	1	1	1	-1	1	-1	-1	-1	1
O08	1	1	3	4	4	1	1	4	1	1	1	1	1	0	0	4	0	0	1	0	0	1	1	1	1	1	1	1	3	4	4	4	4	4
O09	2	2	2	4	4	2	2	4	2	2	2	2	1	0	0	4	0	0	0	0	1	2	2	4	4	2	2	2	3	4	4	4	4	4
O10	-1	-1	-1	-3	-3	-1	-1	-3	-1	-1	-1	-1	3	2	2	3	0	0	3	0	0	-1	-1	-3	-3	-1	-1	-1	-3	-3	-3	-3	-3	-3
O11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O12	2	2	2	1	1	1	2	2	2	2	1	2	4	3	2	4	0	0	1	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1

The sign indicates whether the actor is likely to reach objective or not. 0: Objective has a bleak outcome. 1: Objective  $O_i$  jeopardises (is vital for) the actor's  $A_j$  operating procedures. 2: Objective  $O_i$  jeopardises the actor's  $A_j$  choice/is vital for its choice. 3: Objective  $O_i$  jeopardises (is indispensable for) the actor's  $A_j$  functions. 4: Objective  $O_i$  jeopardises (is indispensable for) the actor's  $A_j$  existence.

Table 7 (see the entire matrix in Table A2) collects the net scale: NS of influences for each agent. In this case, the net influence of project managers (with 209 points), public administrations (with 157), construction managers (with 84) and project and work supervisors (with 81) stands out, as well as the net dependence of product suppliers (with 82 negative points), self-employed workers (with −73) and even construction companies (with −69). Additionally, Table 8 draws the competitiveness (and maximum competitiveness):  $R_i$ ,  $Q_i$  in each agent's case, in which the positions of project managers (by delegation of the developers), real estate developers (as direct clients) and public administrations (for their power to demand legally compliant solutions), as well as construction managers (as assistant project managers during the construction phase) and owners (due to exploitation of the promotion) highlight above the rest. The project designers are in an intermediate position, even though they have the intellectual right to the object of the construction. Likewise, those responsible for ensuring that the work is carried out in accordance with the contracts and the rules for smooth construction (project and work supervisors and control entities) are also at an intermediate level of the hierarchy. On the other hand, the actors in charge of materialisation (main and specific contractors) are at the bottom of the scale and are highly dependent on the other agents involved. Table 9 summarizes simple, valued and weighted valued of convergences and divergences: CV, DV between agents (see the entire matrices in Tables A4–A11). Both in terms of alignment and mobilisation, the position of project managers and construction managers stands out for their contribution to the leadership, organization and coordination of the process. In addition, project managers are also highlighted in terms of divergence, along with the real estate developers, who are the initiators of the entire building process and recruiters directly or indirectly of most of the participants. Additionally, it is worth noting the neutral position of public administrations and professional associations. Finally, Table 10 summarises the simple, valued and weighted valued of agreements and disagreements: OK, KO, as well as the mobilisation: MB that the objectives cause between the agents. The objective that achieves the most agreements is the project scope (with 31, 104 and 90.9 points, respectively), followed by the project quality (with 31, 88 and 71.4) and the technical performance (with 28.77 and 74.3), all of them related to compliance with requirements. On the contrary, the objectives that cause the most disagreements among agents are the project cost and time (with −27, −73 and −67 points), the other two elements of the “triple constraint”, followed by its profitability (with −25, −47 and −30).

Figure 3 shows the map of relationships between agents, differentiating between the technical project and the building work. In both stages, the dominant position of project managers and public administrations stands out, whereas the construction managers do so during the building work. In addition, real estate developers, owners, end-users, financial institutions, insurance companies, control entities and waste managers also act as autonomous agents throughout the whole process. During the technical project, the main figures recognised as building agents in the LOE (project designers and telecommunications designers) act as intermediary agents (together with health and safety coordinators and professional associations), and those outsourced by them (structural designers, facility designers, energy efficiency certifiers and project health and safety coordinators), as dominated agents (together with environmental consultants, health and safety planners and use and maintenance planners). In contrast, owners, end-users, financial institutions, insurance companies, and control entities do so as autonomous agents, as well as topographical and geotechnical consultants and interior designers, landscapers and decorators. During the building work, those figures recognised as building agents in the LOE (work directors, executive work directors, telecommunications supervisors and work health and safety coordinators) also act as intermediary agents, and those outsourced by them (structural and facility supervisors), construction companies and their entire supply chain become dominated agents.

**Table 6.** Summary of Direct and Indirect and Maximum Influences and Dependencies between Actors (DI, II, MI, DD, ID, MD). Extracted from Tables 4, A1 and A3.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
DI	1	4	26	8	8	8	9	1	6	8	7	11	11	8	0	53	17	17	6	5	9	16	15	8	9	9	10	10	15	10	2	1	4	4
II	13	34	102	63	66	68	72	13	53	68	60	85	74	37	0	226	157	127	26	25	81	83	125	61	69	69	75	75	36	93	7	5	26	26
MI	13	13	36	20	20	20	24	13	20	24	20	24	64	27	0	75	32	22	18	16	23	30	25	24	24	24	24	27	27	5	5	17	17	
DD	5	8	17	12	13	11	10	5	12	11	13	11	8	5	5	6	0	31	6	8	6	12	7	10	11	11	12	11	16	4	4	7	12	16
ID	41	55	119	92	103	72	85	26	99	92	89	90	62	19	18	17	0	181	19	20	20	81	44	64	74	75	81	78	105	9	19	44	99	108
MD	29	31	32	31	31	30	30	25	30	27	30	30	20	11	14	13	0	39	12	12	13	29	20	29	29	29	29	27	22	9	19	19	20	26

**Table 7.** Summary of Net Scale of Influences and Dependencies between Actors (NS). Extracted from Table A2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
NS	-28	-21	-17	-29	-37	-4	-13	-13	-46	-24	-29	-5	12	18	-18	209	157	-54	7	5	61	2	81	-3	-5	-6	-6	-3	-69	84	-12	-39	-73	-82

**Table 8.** Competitiveness Relationships and Maximum Competitiveness Relationships between Actors (Ri, Qi). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
Ri	0.1	0.3	1.2	0.6	0.6	0.9	0.8	0.1	0.5	0.7	0.6	1.1	1.1	0.6	0.0	5.8	4.4	1.3	0.4	0.4	1.8	1.1	2.5	0.8	0.9	0.9	0.9	0.9	0.2	2.3	0.0	0.0	0.1	0.1
Qi	0.3	0.3	1.5	0.6	0.6	0.6	0.8	0.3	0.6	0.9	0.6	0.8	3.7	1.5	0	4.9	2.4	0.6	0.8	0.7	1.1	1.2	1.1	0.8	0.8	0.8	0.8	0.9	1.1	1.5	0.1	0.1	0.6	0.5



**Table 9.** Summary of Convergences and Divergences among Actors. Extracted from Tables A6–A11.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
SCV	331	331	331	331	331	331	331	331	331	331	331	331	267	157	157	311	0	0	101	186	257	331	308	331	331	331	331	331	311	331	311	311	311	331
VCV	652	652	686	790	790	623	638	838	692	650	645	665	462	282	307	734	0	0	143	401	533	645	664	751	751	638	609	636	754	844	819	765	765	740
WCV359	432	698	601	604	551	560	388	486	541	501	645	454	221	0	2512	0	0	107	249	698	632	1098	629	662	563	556	586	410	1436	343	327	377	382	
SDV	19	19	19	19	19	19	19	19	19	19	19	19	83	83	83	39	0	0	79	54	10	19	15	19	19	19	19	39	19	39	39	39	19	
VDV	33	33	37	48	48	33	33	54	33	33	37	33	165	180	182	90	0	0	188	141	15	37	29	48	48	33	33	33	68	48	73	73	73	38
WDV17	20	34	31	31	26	26	19	21	24	25	28	155	132	0	318	0	0	116	91	11	33	41	34	36	26	27	27	36	72	31	30	34	18	

SCV: Simple Convergences. SDV: Simple Divergences. VCV: Valued Convergences. VDV: Valued Divergences. WCV: Weighted Valued Convergences. WDV: Weighted Valued Divergences.

**Table 10.** Agreements, Disagreements and Mobilization in relation to the Objectives. Extracted from Tables 5, A4 and A5.

	O01	O02	O03	O04	O05	O06	O07	O08	O09	O10	O11	O12
SOK	5	5	31	31	29	29	24	28	28	5	32	32
VOK	11	8	88	104	45	47	34	59	77	13	32	55
WOK	4.5	3.4	76.4	90.9	44.7	46.4	28.9	57.8	74.3	23.0	28.3	61.5
SKO	−27	−27	0	0	0	0	−4	0	0	−25	0	0
VKO	−73	−73	0	0	0	0	−4	0	0	−47	0	0
WKO	−67	−67	0	0	0	0	−1	0	0	−30	0	0
MB	71.6	70.5	76.4	90.9	44.7	46.4	29.3	57.8	74.3	53.1	28.3	61.5

SOK: Simple Agreements. SKO: Simple Disagreements. VOK: Valued Agreements. VKO: Valued Disagreements. WOK: Weighted Valued Agreements. WKO: Weighted Valued Disagreements. MB: Degree of Mobilization.

Figure 4 shows the net distances between agents in relation to their positions on the project objectives. During the technical project, it is worth noting the distance between the technical agents explicitly listed in the LOE and their subcontractors (who may also act as partial technical agents, hence their conflicting positions). On the other hand, during the building work, it is worth noting the distance between the construction managers and the construction companies and their entire supply chain (thanks to this position, directors and supervisors can focus on the fulfilment of requirements). However, both in the technical project and in the building work, the aligned position of real estate developers, owners, end-users (as direct and indirect clients) and project managers stands out. Finally, Figure 5 shows the net distances between objectives. During the design of the technical project, it is worth noting the distance between the scope and quality (stressing the difference between doing the right things and doing the things right) and between cost and time (as the reverse side of the same purpose), as well as the alignment between health and safety and environment. On the other hand, during the building work, it is worth noting both the distance between scope and quality, and cost and time (as in the design of the technical project). On the contrary, throughout the whole process, the alignment of profitability, productivity and technical performance stands out.

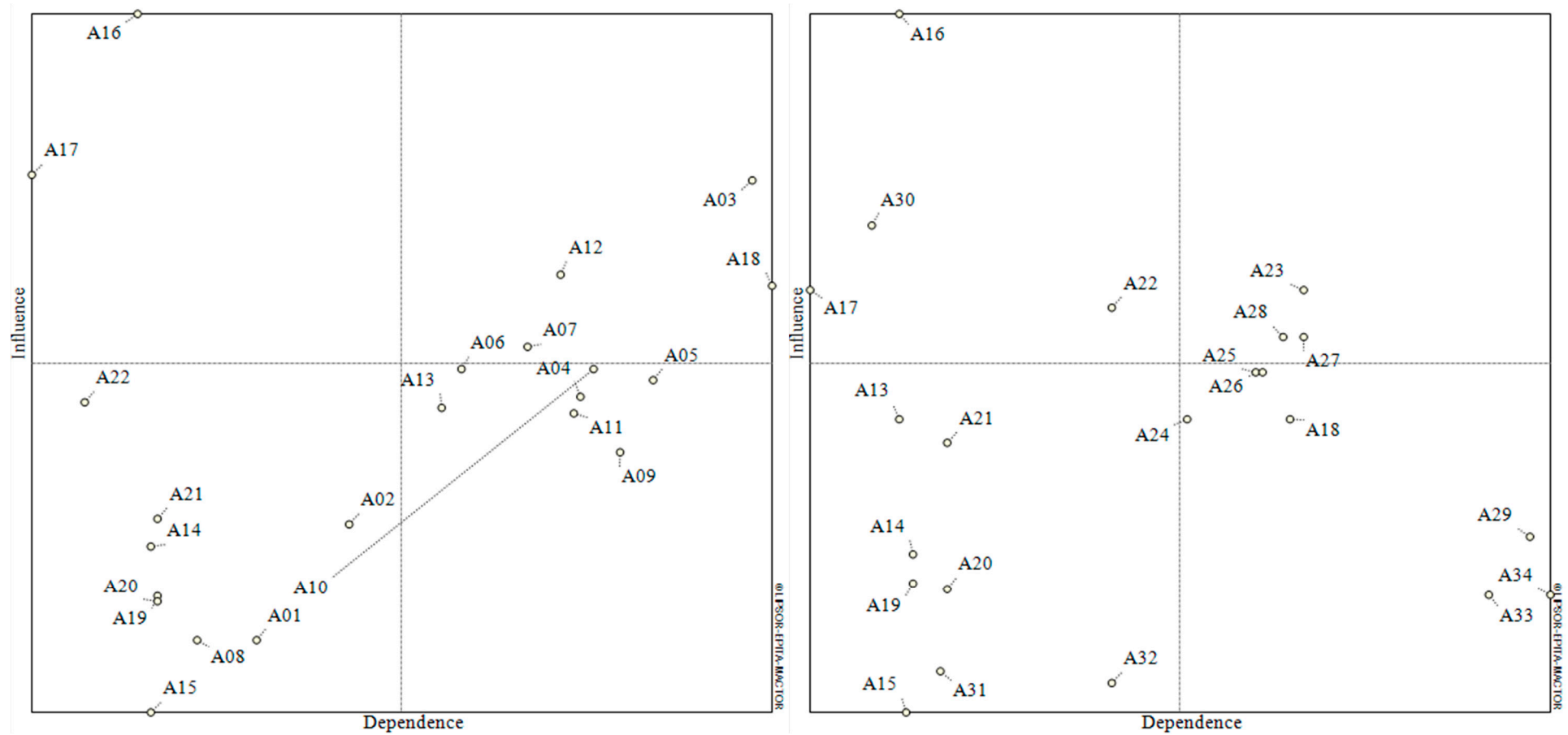


Figure 3. Map of Influences and Dependencies between Actors (left: Technical Project, right: Building Work). Extracted from MACTOR Software version 5.1.2.

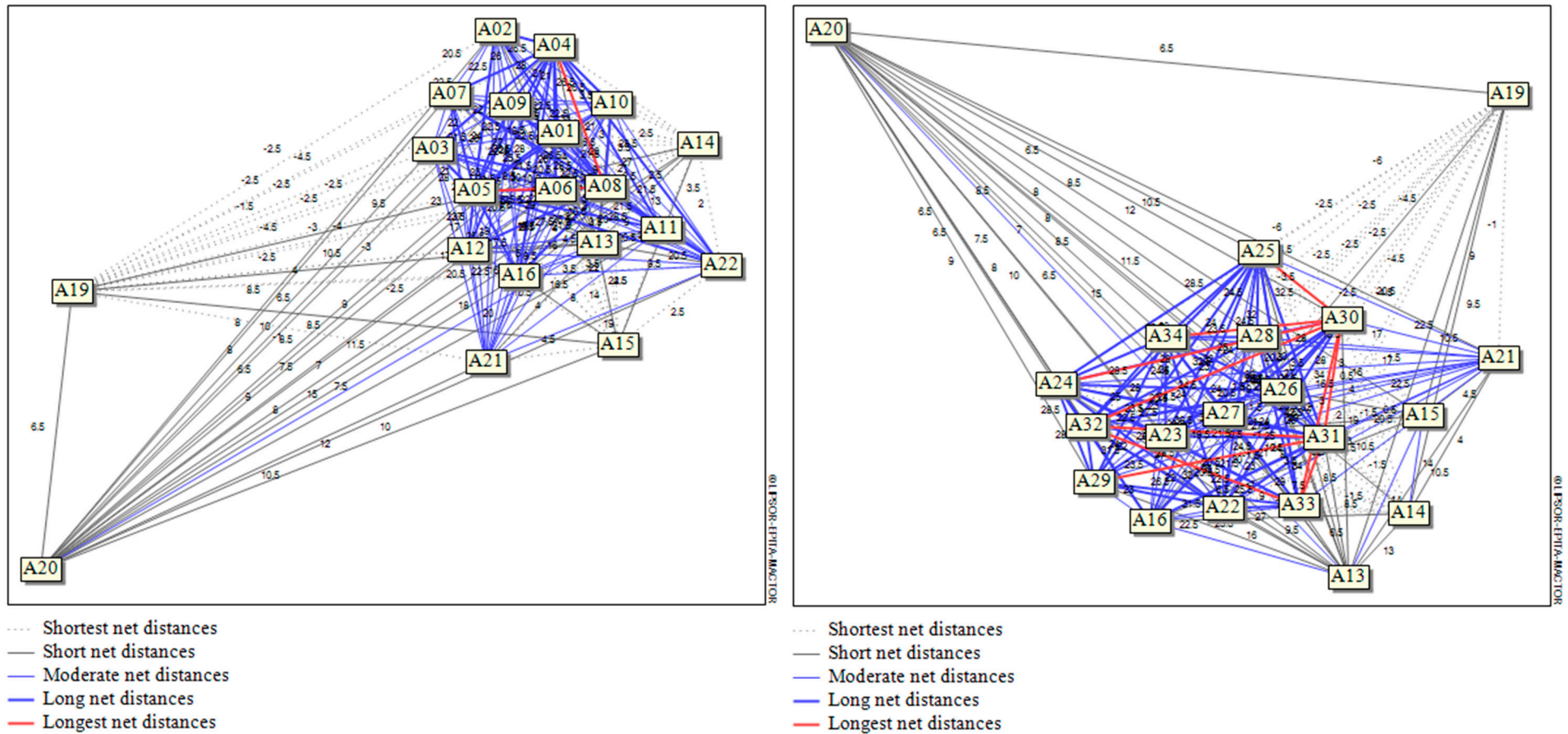


Figure 4. Net Distances between Actors (left: Technical Project, right: Building Work). Extracted from MACTOR Software version 5.1.2.



## 5. Discussion

Scenario analysis based on prospective tools [99] has proven useful in preparing possible potential scenarios. This is one of the crucial stages of planning [100], as the resolution of conflicts stemming from having differing individual goals conditions the evolution of the project. In this setting, once the relevant agents in a IPM context are identified, a stakeholder analysis has made it possible to understand their power relationships and alignments. This improves stakeholder management, which is a key factor in achieving optimal outcomes [101]. Nevertheless, this would require consistent behaviour on the part of agents in achieving their goals, which may not happen, as they are reluctant to reveal their strategic approaches and their means of action. Therefore, instead of using the stakeholders themselves as a method for gathering the data [102], a panel of experts using the Delphi Technique [103] is established, with a notably neutral nature. If reliable information is available, the needs of stakeholders relating to information [104] can be grouped by their alignments, agreements and convergences.

From a theoretical point of view, the results of the MACTOR analysis explain that the influence and interdependence between stakeholders show the strength of the competitiveness of stakeholders in determining the objectives to be formulated. The higher the competitiveness, the stronger the influence in accommodating each other's interests. The MACTOR score also indicates the level of stakeholder approval. In addition, this score shows the convergence and divergence between stakeholders and compiles their agreements and disagreements. Thanks to the measurement of the relationships of power of each pair of stakeholders and the position of each stakeholder with respect to each objective provided by the panel of experts, the MACTOR tool allows the:

- Creation of agents' strategy, once their goals, objectives, preferences, motivations, constraints, coherence and attitude are identified.
- Identification of strategic stakes and their corresponding objectives, once converging and diverging objectives between agents are determined.
- Position of each agent with respect to the strategic objectives.
- Gathering of all possible tactics (alliance and conflict games), once the stakeholders' position with respect to the different objectives is evaluated.
- Calculation of the competitiveness between stakeholders, once the structure of direct and indirect influences is analysed.
- Integration of the competitiveness of each stakeholder to the degree of his/her/its positioning with respect to objectives.
- Formulation of strategic recommendations and key questions for the future, which are beyond the scope of this research.

From a practical point of view, the network of influences and dependences between the agents and their position regarding the overall objectives allows potential conflicts and alliances to be identified, thanks to their agreements, disagreements, convergences and divergences. Thanks to prospective analysis, the direct and indirect influences between each pair of agents, as well as their dependences, are known. Once the agreements, disagreements, convergences and divergences of these agents with respect to each project objective are known, alliances can be established and conflicts avoided. This can apply to different regulatory frameworks and different contract modalities between the agents involved in the building process, thanks to the MDI (which measures the jeopardy between each pair of agents) and 2MAO (which measures the intensity of the priority of each objective for each agent) matrices. Different contexts will lead to different relationships of power between agents and different positions of the agents with respect to the project objectives, but thanks to MACTOR it will be possible to gather all possible tactics (alliance and conflict games). In summary, this tool enables the visualisation of agent groups (with converging interests), their apparent degree of freedom, also to identify those agents potentially more at risk and to analyse the stability of the system.

IPM contracts generate multiple benefits in organisations, reducing the failure rate of projects undertaken [105], so that traditional contracts included in the Spanish LOE are

being superseded. Despite not being explicitly included in the Spanish legal system, the figure of the project manager (for the entire building process) and of the construction manager (for the contracting and building work), must be highlighted for their central roles. In this study, both project and construction managers achieve the highest number of convergences, establishing the greatest number of relationships with the other agents. In this way, this study can be used as a precedent in Spain to address the responsibilities of these agents, placing them fully in the building process, despite having no specific professional powers reserved [41]. However, all the agents must reflect their respective interests in defining the project from the beginning [10], for which they must know the hierarchical structure of their relationships, specially project designers and work supervisors, which are the following agents in number of convergences and play the managerial roles in traditional contracts [106]. Accordingly, the IPM places the Spanish system in an international context, mitigating the effects of the singularity of the Spanish regulatory framework [44] related to the roles, functions and responsibilities of the active stakeholders (buildings agents) that are present during the process. On the contrary, the neutral position of final users (because they are not present during the building process), public administrations and self-regulatory professional bodies can be stressed.

With regard to the position of each agent with respect to the project objectives, in this study the scope objective has achieved the most agreements among the building agents identified (90.9%). This result is aligned with the literature that holds that most of the conflicts and crises between building agents that occur in a building project stem from a lack of (or mis-) definition [107]. This lack of definition can lead to moments of tension when responsibility is sought from the rest of the agents. In fact, the lack of cooperation between agents has been identified for almost 20 years as one of the biggest causes of deficiency in the construction industry [108]. In this scenario, knowing about their relationships of power is critical to finding a solution to these problems. In addition, the quality and the technical performance objectives are the second (76.4%) and third (74.3%) most agreed objectives, respectively, confirming that legal and stakeholders' requirements must be considered, but doing it in an effective and efficient manner. This contributes to client satisfaction [109], the fourth objective with the most agreement among the agents in this study (61.5%). The following objective to be taken into account was productivity (57.8%). This contrasts with the lack of productivity in the Spanish building sector, which has barely increased by 1% in the last 20 years, despite the increase in the turnover of Spanish construction companies in recent years. The rest of the objectives do not reach 50% agreement, although health and safety and environment are close (44.7% and 46.4%, respectively). Functionality (28.9%), communication (28.3%) and profitability (23.0%) are only around 25%. On the contrary, cost (4.5%) and time (3.4%) generate the greatest disagreements among agents, becoming another two of the major sources of failure in construction projects, as stated in the literature [110].

## 6. Conclusions

The Spanish model related to the organization of enabling degrees and professional practice is a specific model that is not widespread in Europe. Certain academic degrees legally have their own sphere of competences that directly enable the practice of a profession in the construction sector (aeronautical, agronomic, civil, geological, industrial, mining, organizational, telecommunications and topographical engineers and technical engineers, as well as architects and technical architects), ensuring their presence in the building process, which is not the case in other countries. However, although this is not mandatory, these agents participate in the process in different countries of the EU, although under different names, but with similar roles and responsibilities (safety managers instead of health and safety planners or project and work health and safety coordinators, quantity surveyors instead of work supervisors, etc.).

The IPM contract allows technicians to focus on the functions explicitly included in their professional powers, (technical design of the projects and/or subsequent supervision

or coordination of the works). This frees them from other management tasks (requirements analysis, quality plans, budgets, certifications, obtaining administrative licenses, selection of suppliers, comparison of offers, etc.), which are performed implicitly in the traditional contract, often without remuneration or specific preparation to do so.

According to the objectives outlined in this research and answering the research questions (defining and determining the relationships of power between building agents and their position in relation to the overall objectives of the project), it was necessary to select a method that allows analysis of both the qualitative and quantitative variables that make up the different scenarios, their characteristics, interdependencies between them and their limits. MACTOR is a simple but useful tool that leads to a better understanding of the power play and relationships between building agents. The added value provided by MACTOR derives mainly from the position of the agents in relation to their goals, as well as from the tactics for possible alliances and conflicts and strategic recommendations to prevent potential future scenarios based on their agreements and convergences and taking into account their disagreements and divergences. In this sense, thanks to the compilation of data from the matrices of dependences and direct influences (MDI) and valued positions (2MAO), the necessary information is obtained to understand the relationships between agents and their alignment with the objectives, which allows their behaviour to be predicted, allowing possible problems between agents, as well as deviations from the project's objectives, to be prevented.

These analyses are applicable in situations that are difficult to foresee, in which multiple actors are involved and varying interests, perspectives, and options collide. The MACTOR results explain that the influence and interdependence between active stakeholders and show how powerful the competitiveness of stakeholders is in determining the overall objectives to be formulated. The higher the competitiveness, the stronger the influence of building agents in accommodating the interests of each agent. The methodology employed is not only an instrument that helps in decision-making itself, but it also provides an instrument for group use.

The study of building agents shows the importance of project managers, as drivers (and leaders) of the projects, exerting decisive influence over the other agents. It is also worth noting the role played by public administrations (for their ability to demand solutions that comply with legality), by construction managers (as assistant project managers during the construction phase of the building), by developers (as direct clients) and by owners (as holders of the property). The designers are in intermediate positions, despite possessing the intellectual rights of the object of construction. In addition, those responsible for implementing contracts and projects accordingly and to good construction standards (project and work supervisors and control entities) are also at an intermediate level of hierarchy. On the other hand, those agents involved in implementation (main and specific contracts), are at the lower end of the scale, presenting a strong dependence on the other agents involved.

The study of the project objectives shows that correct scope is essential for good project completion. However, the other two main constraints (time and cost) are the objectives that cause the greatest conflict of interest among building agents. With regard to the agreements and disagreements that these cause between agents, the greatest convergences occur between project managers and construction managers, exceeding those that occur between them and agents with specific professional power. Conversely, the greatest divergences are between project managers and developers, owners, financial institutions and insurance companies, although these divergences are five times less than the convergences outlined. The presence of managerial agents thanks to the IPM contract allows developers to delegate operational decisions, technicians to focus on their technical goals without assuming functions not explicitly included in their contracts and professionals to be controlled.

In short, the stakeholder analysis reflects that, in an IPM contractual context, the influence of technical agents (project designers and project and work supervisors) is reduced by limiting their functions to those marked by the regulatory framework, as well as



reducing the room for manoeuvre of professionals, subjected to systematised monitoring and supervision, whose mission is masked in other forms of contract (for technicians in the traditional model and for professionals in the turnkey model). In addition, prospective analysis highlights the importance of defining scope (and quality) from the early stages of a project, as well as the need to reach multilateral agreements based on the other two main project constraints: time and cost, based on the convergences and agreements that the technical performance provides. However, further research is required to adjust policies, strategies and routines that ensure potential future scenarios. Given that this study is the first study, it is recommended to continue this line of research with another tool from the prospective analysis, such as MICMAC, that is a structural prospective analysis used to study indirect relationships and MULTIPOL, which is another prospective analysis used to compare different actions or solutions for problems according to multiple criteria and policies.

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## Appendix A

Appendix A contains the entire MDII, MMDII, 1MAO, 3MAO, 1CAA, 1DAA, 2CAA, 2DAA, 3CAA and 3DAA matrices.

Table A1. Matrix of Direct and Indirect Influences (MDII). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	
A01	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A02	1	2	4	4	3	1	3	1	3	3	2	3	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A03	2	3	12	10	11	8	6	1	8	8	10	7	4	1	1	1	0	14	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A04	2	3	7	7	6	4	6	1	5	5	4	4	3	0	0	0	0	7	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A05	2	2	7	6	7	5	6	1	5	5	5	5	3	0	0	0	0	8	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A06	2	2	7	6	7	5	6	1	5	5	5	5	3	0	0	0	0	8	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A07	2	2	7	6	7	5	6	1	5	5	5	5	4	1	1	1	0	8	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A08	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A09	2	3	5	3	4	3	3	1	5	5	5	5	2	0	0	0	0	6	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A10	2	3	6	4	5	4	4	1	6	6	6	6	4	1	1	1	0	7	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A11	2	3	6	3	5	4	3	1	6	6	6	6	2	0	0	0	0	7	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A12	2	3	9	6	8	5	6	1	7	7	7	7	4	1	1	1	0	10	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
A13	3	3	2	0	0	2	2	4	2	2	2	2	2	4	3	5	0	0	5	7	4	3	2	0	0	2	2	2	3	4	0	0	0	4	
A14	1	1	1	0	0	1	1	1	1	1	1	1	3	4	5	2	0	0	3	3	3	1	1	0	0	1	1	1	1	1	0	0	0	1	
A15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A16	4	5	13	9	10	6	8	5	8	7	7	7	6	2	1	2	0	22	2	4	5	5	8	7	8	8	8	7	10	4	3	4	10	13	
A17	2	3	10	8	9	5	8	1	8	7	6	7	6	2	1	1	0	12	2	1	1	2	6	5	6	6	6	6	6	0	1	1	6	6	
A18	2	3	11	7	8	5	6	1	8	8	7	7	4	0	0	0	0	15	0	0	0	0	6	4	5	5	6	6	6	0	0	0	6	6	
A19	0	1	1	1	1	0	0	0	0	0	0	0	3	3	2	2	0	0	3	4	3	0	1	1	1	1	1	0	0	0	0	0	0	0	
A20	0	1	1	1	1	0	0	0	0	0	0	0	3	3	2	2	0	0	3	2	3	0	1	1	1	1	1	0	0	0	0	0	0	0	
A21	1	3	4	3	2	2	1	1	4	4	3	3	1	0	0	0	0	8	0	0	0	0	5	3	4	4	5	5	5	0	0	0	5	5	
A22	1	2	6	4	5	3	4	1	6	5	5	5	3	0	0	0	0	12	0	0	0	3	6	4	5	5	6	6	9	0	1	3	9	9	
A23	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	9	0	0	0	3	6	7	8	5	6	6	8	0	1	3	8	8	
A24	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	5	0	0	0	3	4	4	4	4	4	4	6	0	1	3	6	6	
A25	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	6	0	0	0	3	5	4	5	5	5	5	7	0	1	3	7	7	
A26	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	6	0	0	0	3	5	4	5	5	5	5	7	0	1	3	7	7	
A27	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	7	0	0	0	3	6	4	5	5	6	6	8	0	1	3	8	8	
A28	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	7	0	0	0	3	6	4	5	5	6	6	8	0	1	3	8	8	
A29	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3	1	1	1	1	1	1	5	0	4	7	5	5	
A30	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0	1	0	6	0	1	1	4	7	4	5	6	7	7	10	1	1	3	9	10	
A31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	1	2	1	1	
A32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	1	1	
A33	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3	1	1	1	1	1	1	4	0	1	3	3	3	
A34	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3	1	1	1	1	1	1	4	0	1	3	3	3	

Table A2. Net Scale of Influences (NS). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34		
A01		0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	-2	-1	0	-4	-2	-1	0	0	-1	-1	-1	-1	-1	-1	-1	0	-1	0	0	0	0			
A02	0		1	1	1	-1	1	0	0	0	-1	0	-1	-1	0	-5	-3	1	-1	-1	-3	-2	-1	-1	-1	-1	-1	0	-1	0	0	0	0			
A03	1	-1		3	4	1	-1	0	3	2	4	-2	2	0	1	-12	-10	3	0	-1	-4	-6	0	0	0	0	0	0	-1	-1	0	0	-1	-1		
A04	1	-1	-3		0	-2	0	0	2	1	1	-2	3	0	0	-9	-8	0	-1	-1	-3	-4	0	0	0	0	0	0	0	0	0	-1	0	0	-1	-1
A05	1	-1	-4	0		-2	-1	0	1	0	0	-3	3	0	0	-10	-9	0	-1	-1	-2	-5	0	0	0	0	0	0	-1	0	0	0	-1	-1		
A06	1	1	-1	2	2		1	0	2	1	1	0	1	-1	0	-6	-5	3	0	0	-2	-3	0	0	0	0	0	0	-1	0	0	0	0	0		
A07	1	-1	1	0	1	-1		0	2	1	2	-1	2	0	1	-7	-8	2	1	0	-1	-4	0	0	0	0	0	0	-1	-1	0	0	-1	-1		
A08	0	0	0	0	0	0	0		0	0	0	0	-3	-1	0	-5	-1	0	0	0	-1	-1	0	0	0	0	0	0	-1	0	0	0	0	0		
A09	1	0	-3	-2	-1	-2	-2	0		-1	-1	-2	0	-1	0	-8	-8	-2	0	0	-4	-6	0	0	0	0	0	-1	-1	0	0	-1	-1			
A10	1	0	-2	-1	0	-1	-1	0	1		0	-1	2	0	1	-6	-7	-1	1	0	-4	-5	0	0	0	0	0	0	-1	0	0	0	0	0		
A11	1	1	-4	-1	0	-1	-2	0	1	0		-1	0	-1	0	-7	-6	0	0	0	-3	-5	0	0	0	0	0	0	-1	0	0	0	0	0		
A12	1	0	2	2	3	0	1	0	2	1	1		2	0	1	-6	-7	3	1	0	-3	-5	0	0	0	0	0	-1	-1	0	0	-1	-1			
A13	2	1	-2	-3	-3	-1	-2	3	0	-2	0	-2		1	3	-1	-6	-4	2	4	3	0	2	0	0	2	2	2	3	4	0	0	0	4		
A14	1	1	0	0	0	1	0	1	1	0	1	0	-1		5	0	-2	0	0	0	3	1	1	0	0	1	1	1	1	1	1	1	0	0	1	
A15	0	0	-1	0	0	0	-1	0	0	-1	0	-1	-3	-5		-1	-1	0	-2	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A16	4	5	12	9	10	6	7	5	8	6	7	6	1	0	1		-1	22	0	2	5	5	8	7	8	8	8	7	10	3	3	4	10	13		
A17	2	3	10	8	9	5	8	1	8	7	6	7	6	2	1	1		12	2	1	1	2	6	5	6	6	6	6	6	0	1	1	6	6		
A18	1	-1	-3	0	0	-3	-2	0	2	1	0	-3	4	0	0	-22	-12		0	0	-8	-12	-3	-1	-1	-1	-1	-1	6	-6	0	0	6	6		
A19	0	1	0	1	1	0	-1	0	0	-1	0	-1	-2	0	2	0	-2	0		1	3	0	1	1	1	1	1	0	0	0	0	0	0	0		
A20	0	1	1	1	1	0	0	0	0	0	0	0	-4	0	2	-2	-1	0	-1		3	0	1	1	1	1	1	0	0	-1	0	0	0	0		
A21	1	3	4	3	2	2	1	1	4	4	3	3	-3	-3	0	-5	-1	8	-3	-3		0	5	3	4	4	5	5	5	-1	0	0	5	5		
A22	1	2	6	4	5	3	4	1	6	5	5	5	0	-1	0	-5	-2	12	0	0	0		3	1	2	2	3	3	6	-4	0	2	6	6		
A23	1	1	0	0	0	0	0	0	0	0	0	0	-2	-1	0	-8	-6	3	-1	-1	-5	-3		3	3	0	0	0	7	-7	1	3	7	7		
A24	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-7	-5	1	-1	-1	-3	-1	-3		0	0	0	5	-4	1	3	5	5			
A25	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-8	-6	1	-1	-1	-4	-2	-3	0		0	0	6	-5	1	3	6	6			
A26	1	1	0	0	0	0	0	0	0	0	0	0	-2	-1	0	-8	-6	1	-1	-1	-4	-2	0	0	0		0	6	-6	1	3	6	6			
A27	1	1	0	0	0	0	0	0	0	0	0	0	-2	-1	0	-8	-6	1	-1	-1	-5	-3	0	0	0	0		7	-7	1	3	7	7			
A28	1	1	0	0	0	0	0	0	0	0	0	0	-2	-1	0	-7	-6	1	0	0	-5	-3	0	0	0	0		7	-7	1	3	7	7			
A29	0	0	1	1	1	0	1	0	1	0	0	1	-3	-1	0	-10	-6	-6	0	0	-5	-6	-7	-5	-6	-6	-7	-7		-10	2	6	1	1		
A30	1	1	1	0	0	1	1	1	1	1	1	1	-4	0	0	-3	0	6	0	1	1	4	7	4	5	6	7	7	10		1	3	9	10		
A31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-3	-1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-2	-1		1	0	0		
A32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	-1	0	0	0	0	-2	-3	-3	-3	-3	-3	-3	-6	-3	-1		-2	-2		
A33	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	-10	-6	-6	0	0	-5	-6	-7	-5	-6	-6	-7	-7	-1	-9	0	2		0		
A34	0	0	1	1	1	0	1	0	1	0	0	1	-4	-1	0	-13	-6	-6	0	0	-5	-6	-7	-5	-6	-6	-7	-7	-1	-10	0	2	0			

**Table A3.** Matrix of Maxima Direct and Indirect Influences (MMDII). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34		
A01	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
A02	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A03	1	1	0	4	4	4	1	1	1	1	4	1	1	1	1	1	0	2	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
A04	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	2	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
A05	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	2	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
A06	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	2	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
A07	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	2	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
A08	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A09	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	2	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
A10	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	2	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
A11	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	2	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
A12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	2	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
A13	3	3	2	0	0	2	2	4	2	2	2	2	0	2	2	4	0	0	4	3	3	3	2	0	0	2	2	2	3	4	0	0	0	0	4	
A14	1	1	1	0	0	1	1	1	1	1	1	1	1	0	4	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0	1	
A15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A16	3	3	2	2	2	2	2	4	2	2	2	2	1	1	1	0	0	2	1	3	3	3	2	2	2	2	2	2	3	4	3	3	3	3	4	
A17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
A18	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1
A19	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	3	2	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
A20	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	2	0	1	1	1	1	1	0	0	0	0	0	0	0	0
A21	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1
A22	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
A23	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	0	4	4	1	1	1	1	0	1	1	1	1	1	1
A24	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
A25	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1
A26	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1
A27	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	1	1	1	1	0	1	1	0	1	1	0	1	1	1
A28	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	2	0	0	0	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1
A29	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	4	4	3	3	3	3
A30	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
A31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1
A32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1
A33	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1
A34	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0

**Table A4.** Matrix of Simple Positions of Actors with respect to Objectives (1MAO). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	
O01	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	0	0	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
O02	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	0	0	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
O03	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O04	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O05	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O06	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O07	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-1	1	-1	-1	-1	1	
O08	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O09	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O10	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	0	0	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
O11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

**Table A5.** Matrix of Weighted Valued Positions of Actors with respect to Objectives (3MAO). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
O01	-0.2	-0.7	-2.3	-2.5	-2.6	-1.7	-1.7	-0.4	-0.9	-1.5	-1.2	-2.1	1.1	1.2	0	-17.40	0	1.1	1.1	-1.8	-5	-2.2	-3.1	-3.4	-1.7	-1.8	-1.9	-0.7	-9.3	-0.2	0	-0.5	-0.2	
O02	-0.2	-0.7	-2.3	-2.5	-2.6	-1.7	-1.7	-0.4	-0.9	-1.5	-1.2	-2.1	1.1	1.2	0	-17.40	0	0.4	0.7	-1.8	-5	-2.2	-3.1	-3.4	-1.7	-1.8	-1.9	-0.7	-9.3	-0.2	0	-0.5	-0.2	
O03	0.2	1	3.5	2.5	2.6	1.7	1.7	0.4	0.9	1.5	1.2	2.1	1.1	0.6	0	17.4	0	0	0	1.1	5.4	5	3.3	3.1	3.4	1.7	1.8	1.9	0.7	9.3	0.2	0	0.5	0.5
O04	0.3	1.4	3.5	2.5	2.6	3.4	3.4	0.4	1.9	2.2	2.4	4.2	1.1	0.6	0	17.4	0	0	0	1.1	5.4	10	2.2	3.1	3.4	3.4	1.8	1.9	0.7	9.3	0.2	0	0.5	0.5
O05	0.1	0.3	1.2	0.6	0.6	0.9	0.8	0.1	1.4	0.7	0.6	1.1	1.1	0	0	5.8	0	0	0	1.1	5.4	7.5	1.1	0.8	0.9	0.9	0.9	2.8	0.7	7	0.1	0	0.1	0.1
O06	0.1	0.3	1.2	0.6	0.6	0.9	0.8	0.1	1.4	2.2	0.6	3.2	1.1	0	0	5.8	0	0	0	1.1	5.4	7.5	1.1	0.8	0.9	0.9	0.9	0.9	0.7	7	0.1	0	0.1	0.1
O07	0.1	0.3	3.5	0.6	0.6	0.9	0.8	0.4	0.5	0.7	1.8	1.1	1.1	0.6	0	5.8	0	0	0	0	0	0	3.3	0.8	0.9	0.9	0.9	0.9	-0.2	2.3	0	0	-0.1	0.1
O08	0.1	0.3	3.5	2.5	2.6	0.9	0.8	0.4	0.5	0.7	0.6	1.1	1.1	0	0	23.2	0	0	0.4	0	0	2.5	1.1	0.8	0.9	0.9	0.9	0.9	0.7	9.3	0.2	0	0.5	0.5
O09	0.2	0.7	2.3	2.5	2.6	1.7	1.7	0.4	0.9	1.5	1.2	2.1	1.1	0	0	23.2	0	0	0	0	1.8	5	2.2	3.1	3.4	1.7	1.8	1.9	0.7	9.3	0.2	0	0.5	0.5
O10	-0.1	-0.3	-1.2	-1.9	-1.9	-0.9	-0.8	-0.3	-0.5	-0.7	-0.6	-1.1	3.3	1.2	0	17.4	0	0	1.1	0	0	-2.5	-1.1	-2.3	-2.6	-0.9	-0.9	-0.9	-0.7	-7	-0.1	0	-0.4	-0.4
O11	0.1	0.3	1.2	0.6	0.6	0.9	0.8	0.1	0.5	0.7	0.6	1.1	1.1	0.6	0	5.8	0	0	0.4	0.4	1.8	2.5	1.1	0.8	0.9	0.9	0.9	0.9	0.2	2.3	0	0	0.1	0.1
O12	0.2	0.7	2.3	0.6	0.6	0.9	1.7	0.2	0.9	1.5	0.6	2.1	4.4	1.8	0	23.2	0	0	0.4	0.4	1.8	5	2.2	0.8	0.9	1.7	1.8	1.9	0.4	2.3	0	0	0.1	0.1

Table A6. Matrix of Simple Convergences of Objectives between Actors (1CAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
A01	0	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A02	12	0	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A03	12	12	0	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A04	12	12	12	0	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A05	12	12	12	12	0	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A06	12	12	12	12	12	0	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A07	12	12	12	12	12	12	0	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A08	12	12	12	12	12	12	12	0	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A09	12	12	12	12	12	12	12	12	0	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A10	12	12	12	12	12	12	12	12	12	0	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A11	12	12	12	12	12	12	12	12	12	12	0	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A12	12	12	12	12	12	12	12	12	12	12	12	0	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	12	
A13	9	9	9	9	9	9	9	9	9	9	9	9	0	8	8	10	0	0	6	8	7	8	9	9	9	9	9	8	9	8	8	8	9	
A14	5	5	5	5	5	5	5	5	5	5	5	5	8	0	8	6	0	0	5	6	4	4	5	5	5	5	5	4	5	4	4	4	5	
A15	5	5	5	5	5	5	5	5	5	5	5	5	8	8	0	6	0	0	5	6	4	4	5	5	5	5	5	4	5	4	4	4	5	
A16	11	11	11	11	11	11	11	11	11	11	11	11	10	6	6	0	0	0	4	6	9	10	11	11	11	11	11	10	11	10	10	10	11	
A17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
A19	3	3	3	3	3	3	3	3	3	3	3	3	6	5	5	4	0	0	0	4	2	3	3	3	3	3	3	3	3	3	3	3	3	
A20	6	6	6	6	6	6	6	6	6	6	6	6	8	6	6	6	0	0	4	0	6	6	6	6	6	6	6	6	6	6	6	6	6	
A21	9	9	9	9	9	9	9	9	9	9	9	9	7	4	4	9	0	0	2	6	0	9	9	9	9	9	9	9	9	9	9	9	9	
A22	11	11	11	11	11	11	11	11	11	11	11	11	8	4	4	10	0	0	3	6	9	0	11	11	11	11	11	11	11	11	11	11	11	
A23	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	0	12	12	12	12	11	12	11	11	11	12	
A24	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	0	12	12	12	11	12	11	11	11	12	
A25	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	0	12	12	11	12	11	11	11	12	
A26	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	0	12	12	11	12	11	11	11	12
A27	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	0	12	11	12	11	11	11	12
A28	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	0	11	12	11	11	11	12
A29	11	11	11	11	11	11	11	11	11	11	11	11	8	4	4	10	0	0	3	6	9	11	11	11	11	11	11	11	0	11	12	12	11	
A30	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	0	11	11	11	12	
A31	11	11	11	11	11	11	11	11	11	11	11	11	8	4	4	10	0	0	3	6	9	11	11	11	11	11	11	11	12	11	0	12	12	11
A32	11	11	11	11	11	11	11	11	11	11	11	11	8	4	4	10	0	0	3	6	9	11	11	11	11	11	11	11	12	11	12	0	12	11
A33	11	11	11	11	11	11	11	11	11	11	11	11	8	4	4	10	0	0	3	6	9	11	11	11	11	11	11	11	12	11	12	12	0	11
A34	12	12	12	12	12	12	12	12	12	12	12	12	9	5	5	11	0	0	3	6	9	11	12	12	12	12	12	11	12	11	11	11	0	

Table A7. Matrix of Simple Divergences of Objectives between Actors (1DAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34
A01	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A02	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A03	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A04	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A05	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A06	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A07	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A08	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A09	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A10	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A11	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A12	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A13	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	2	0	0	0	0	2	3	3	3	3	3	3	3	4	3	4	4	4	3
A14	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	2	0	0	0	0	2	3	3	3	3	3	3	3	4	3	4	4	4	3
A15	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	2	0	0	0	0	2	3	3	3	3	3	3	3	4	3	4	4	4	3
A16	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	0	0	0	2	2	0	1	1	1	1	1	1	1	2	1	2	2	2	1
A17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A19	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	2	0	0	0	0	2	3	3	3	3	3	3	3	3	3	3	3	3	3
A20	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	2	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
A21	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A22	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A23	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A24	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A25	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A26	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A27	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A28	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0
A29	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	2	0	0	3	2	0	0	1	1	1	1	1	1	0	1	0	0	0	1
A30	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	1	0	1	1	1	0	
A31	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	2	0	0	3	2	0	0	1	1	1	1	1	1	0	1	0	0	0	1
A32	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	2	0	0	3	2	0	0	1	1	1	1	1	1	0	1	0	0	0	1
A33	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	2	0	0	3	2	0	0	1	1	1	1	1	1	0	1	0	0	0	1
A34	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	1	0



Table A8. Matrix of Valued Convergences of Objectives between Actors (2CAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34		
A01	0.0	21.0	22.5	26.5	26.5	20.0	20.5	28.5	22.5	21.0	21.0	21.5	14.0	9.0	10.0	24.0	0.0	0.0	3.5	13.0	17.5	21.5	21.0	25.0	25.0	20.5	19.5	20.5	25.0	28.5	27.5	25.5	25.5	24.5		
A02	21.0	0.0	22.5	26.5	26.5	20.0	20.5	28.5	22.5	21.0	21.0	21.5	14.0	9.0	10.0	24.0	0.0	0.0	3.5	13.0	17.5	21.5	21.0	25.0	25.0	20.5	19.5	20.5	25.0	28.5	27.5	25.5	25.5	24.5		
A03	22.5	22.5	0.0	28.0	28.0	21.5	22.0	30.0	24.0	22.5	22.5	23.0	15.5	9.5	10.5	25.5	0.0	0.0	4.5	12.5	17.0	22.0	22.5	26.5	26.5	22.0	21.0	22.0	25.5	30.0	28.0	26.0	26.0	26.0		
A04	26.5	26.5	28.0	0.0	32.0	25.5	26.0	34.0	28.0	26.5	26.5	27.0	16.5	9.0	10.0	28.5	0.0	0.0	4.5	13.0	20.5	27.0	26.5	30.5	30.5	26.0	25.0	26.0	30.5	34.0	33.0	31.0	31.0	30.0		
A05	26.5	26.5	28.0	32.0	0.0	25.5	26.0	34.0	28.0	26.5	26.5	27.0	16.5	9.0	10.0	28.5	0.0	0.0	4.5	13.0	20.5	27.0	26.5	30.5	30.5	26.0	25.0	26.0	30.5	34.0	33.0	31.0	31.0	30.0		
A06	20.0	20.0	21.5	25.5	25.5	0.0	19.5	27.5	21.5	20.0	20.0	20.5	13.0	8.0	9.0	23.0	0.0	0.0	3.0	12.0	16.5	20.5	20.0	24.0	24.0	19.5	18.5	19.5	24.0	27.5	26.5	24.5	24.5	23.5		
A07	20.5	20.5	22.0	26.0	26.0	19.5	0.0	28.0	22.0	20.5	20.5	21.0	13.5	8.5	9.5	23.5	0.0	0.0	3.5	12.5	17.0	21.0	20.5	24.5	24.5	20.0	19.0	20.0	24.5	28.0	27.0	25.0	25.0	24.0		
A08	28.5	28.5	30.0	34.0	34.0	27.5	28.0	0.0	30.0	28.5	28.5	29.0	18.5	11.0	12.0	30.5	0.0	0.0	5.0	13.5	21.0	27.5	28.5	32.5	32.5	28.0	27.0	28.0	31.0	36.0	33.5	31.5	31.5	32.0		
A09	22.5	22.5	24.0	28.0	28.0	21.5	22.0	30.0	0.0	22.5	22.5	23.0	15.5	8.5	9.5	25.5	0.0	0.0	3.5	14.5	19.0	23.0	22.5	26.5	26.5	22.0	21.0	22.0	26.5	30.0	29.0	27.0	27.0	26.0		
A10	21.0	21.0	22.5	26.5	26.5	20.0	20.5	28.5	22.5	0.0	21.0	21.5	14.0	8.0	9.0	24.0	0.0	0.0	3.5	13.0	17.5	21.5	21.0	25.0	25.0	20.5	19.5	20.5	25.0	28.5	27.5	25.5	25.5	24.5		
A11	21.0	21.0	22.5	26.5	26.5	20.0	20.5	28.5	22.5	21.0	0.0	21.5	14.0	9.0	10.0	24.0	0.0	0.0	3.0	12.0	16.5	20.5	21.0	25.0	25.0	20.5	19.5	20.5	24.0	28.5	27.5	24.5	24.5	24.5		
A12	21.5	21.5	23.0	27.0	27.0	20.5	21.0	29.0	23.0	21.5	21.5	0.0	14.5	8.5	9.5	24.5	0.0	0.0	3.5	13.5	18.0	22.0	21.5	25.5	25.5	21.0	20.0	21.0	25.5	29.0	28.0	26.0	26.0	25.0		
A13	14.0	14.0	15.5	16.5	16.5	13.0	13.5	18.5	15.5	14.0	14.0	14.5	0.0	13.0	14.0	20.0	0.0	0.0	10.5	15.0	12.5	14.5	14.0	15.0	15.0	13.5	12.5	13.5	16.0	18.5	17.5	15.5	15.5	16.5		
A14	9.0	9.0	9.5	9.0	9.0	8.0	8.5	11.0	8.5	8.0	9.0	8.5	13.0	0.0	14.0	12.0	0.0	0.0	9.5	11.5	7.0	7.5	9.0	9.0	9.0	8.5	7.5	7.5	7.5	7.5	7.5	9.0	8.0	8.0	8.0	9.0
A15	10.0	10.0	10.5	10.0	10.0	9.0	9.5	12.0	9.5	9.0	10.0	9.5	14.0	14.0	0.0	13.0	0.0	0.0	9.0	12.0	7.5	8.0	10.0	10.0	10.0	9.5	8.5	8.5	8.0	10.0	8.5	8.5	8.5	10.0		
A16	24.0	24.0	25.5	28.5	28.5	23.0	23.5	30.5	25.5	24.0	24.0	24.5	20.0	12.0	13.0	0.0	0.0	0.0	9.0	13.5	20.0	24.5	24.0	27.0	27.0	23.5	22.5	23.5	27.0	30.5	29.5	27.5	27.5	26.5		
A17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A19	3.5	3.5	4.5	4.5	4.5	3.0	3.5	5.0	3.5	3.5	3.0	3.5	10.5	9.5	9.0	9.0	0.0	0.0	0.0	6.5	2.0	3.5	3.5	3.0	3.0	3.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5	4.5		
A20	13.0	13.0	12.5	13.0	13.0	12.0	12.5	13.5	14.5	13.0	12.0	13.5	15.0	11.5	12.0	13.5	0.0	0.0	6.5	0.0	14.0	14.5	12.0	13.0	13.0	12.5	11.5	12.5	14.5	15.0	15.0	13.0	13.0	13.0		
A21	17.5	17.5	17.0	20.5	20.5	16.5	17.0	21.0	19.0	17.5	16.5	18.0	12.5	7.0	7.5	20.0	0.0	0.0	2.0	14.0	0.0	19.0	16.5	20.5	20.5	17.0	16.0	17.0	20.5	22.5	22.5	20.5	20.5	18.5		
A22	21.5	21.5	22.0	27.0	27.0	20.5	21.0	27.5	23.0	21.5	20.5	22.0	14.5	7.5	8.0	24.5	0.0	0.0	3.5	14.5	19.0	0.0	20.5	25.5	25.5	21.0	20.0	21.0	26.5	29.0	29.0	27.0	27.0	25.0		
A23	21.0	21.0	22.5	26.5	26.5	20.0	20.5	28.5	22.5	21.0	21.0	21.5	14.0	9.0	10.0	24.0	0.0	0.0	3.5	12.0	16.5	20.5	0.0	25.0	25.0	20.5	19.5	20.5	24.0	28.5	26.5	24.5	24.5	24.5		
A24	25.0	25.0	26.5	30.5	30.5	24.0	24.5	32.5	26.5	25.0	25.0	25.5	15.0	9.0	10.0	27.0	0.0	0.0	3.0	13.0	20.5	25.5	25.0	0.0	29.0	24.5	23.5	24.5	29.0	32.5	31.5	29.5	29.5	28.5		
A25	25.0	25.0	26.5	30.5	30.5	24.0	24.5	32.5	26.5	25.0	25.0	25.5	15.0	9.0	10.0	27.0	0.0	0.0	3.0	13.0	20.5	25.5	25.0	29.0	0.0	24.5	23.5	24.5	29.0	32.5	31.5	29.5	29.5	28.5		
A26	20.5	20.5	22.0	26.0	26.0	19.5	20.0	28.0	22.0	20.5	20.5	21.0	13.5	8.5	9.5	23.5	0.0	0.0	3.5	12.5	17.0	21.0	20.5	24.5	24.5	0.0	19.0	20.0	24.5	28.0	27.0	25.0	25.0	24.0		
A27	19.5	19.5	21.0	25.0	25.0	18.5	19.0	27.0	21.0	19.5	19.5	20.0	12.5	7.5	8.5	22.5	0.0	0.0	3.5	11.5	16.0	20.0	19.5	23.5	23.5	19.0	0.0	19.0	23.5	27.0	26.0	24.0	24.0	23.0		
A28	20.5	20.5	22.0	26.0	26.0	19.5	20.0	28.0	22.0	20.5	20.5	21.0	13.5	7.5	8.5	23.5	0.0	0.0	3.5	12.5	17.0	21.0	20.5	24.5	24.5	20.0	19.0	0.0	24.5	28.0	27.0	25.0	25.0	24.0		
A29	25.0	25.0	25.5	30.5	30.5	24.0	24.5	31.0	26.5	25.0	24.0	25.5	16.0	7.5	8.0	27.0	0.0	0.0	4.5	14.5	20.5	26.5	24.0	29.0	29.0	24.5	23.5	24.5	0.0	32.5	33.5	31.5	31.5	28.5		
A30	28.5	28.5	30.0	34.0	34.0	27.5	28.0	36.0	30.0	28.5	28.5	29.0	18.5	9.0	10.0	30.5	0.0	0.0	4.5	15.0	22.5	29.0	28.5	32.5	32.5	28.0	27.0	28.0	32.5	0.0	35.0	33.0	33.0	32.0		
A31	27.5	27.5	28.0	33.0	33.0	26.5	27.0	33.5	29.0	27.5	26.5	28.0	17.5	8.0	8.5	29.5	0.0	0.0	4.5	15.0	22.5	29.0	26.5	31.5	31.5	27.0	26.0	27.0	33.5	35.0	0.0	34.0	34.0	31.0		
A32	25.5	25.5	26.0	31.0	31.0	24.5	25.0	31.5	27.0	25.5	24.5	26.0	15.5	8.0	8.5	27.5	0.0	0.0	4.5	13.0	20.5	27.0	24.5	29.5	29.5	25.0	24.0	25.0	31.5	33.0	34.0	0.0	32.0	29.0		
A33	25.5	25.5	26.0	31.0	31.0	24.5	25.0	31.5	27.0	25.5	24.5	26.0	15.5	8.0	8.5	27.5	0.0	0.0	4.5	13.0	20.5	27.0	24.5	29.5	29.5	25.0	24.0	25.0	31.5	33.0	34.0	32.0	0.0	29.0		
A34	24.5	24.5	26.0	30.0	30.0	23.5	24.0	32.0	26.0	24.5	24.5	25.0	16.5	9.0	10.0	26.5	0.0	0.0	4.5	13.0	18.5	25.0	24.5	28.5	28.5	24.0	23.0	24.0	28.5	32.0	31.0	29.0	29.0	0.0		

Table A9. Matrix of Valued Divergences of Objectives between Actors (2DAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	
A01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0		
A04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	2.5	2.5	2.5	0.0		
A09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0		
A12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A13	5.0	5.0	5.0	8.0	8.0	5.0	5.0	8.0	5.0	5.0	5.0	5.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	2.0	5.0	5.0	8.0	8.0	5.0	5.0	5.0	8.0	8.0	9.0	9.0	9.0	6.0	
A14	5.5	5.5	5.5	8.5	8.5	5.5	5.5	8.5	5.5	5.5	5.5	5.5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	3.0	5.5	5.5	8.5	8.5	5.5	5.5	5.5	8.5	8.5	9.5	9.5	9.5	6.5	
A15	5.5	5.5	5.5	8.5	8.5	5.5	5.5	8.5	5.5	5.5	5.5	5.5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	3.0	5.5	5.5	8.5	8.5	5.5	5.5	5.5	9.0	8.5	10.0	10.0	10.0	6.5	
A16	2.0	2.0	2.0	3.0	3.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0	4.0	5.0	5.0	0.0	0.0	0.0	5.0	5.5	0.0	2.0	2.0	3.0	3.0	2.0	2.0	2.0	4.0	3.0	4.0	4.0	4.0	3.0	
A17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A19	6.0	6.0	6.0	9.0	9.0	6.0	6.0	9.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	3.0	6.0	6.0	9.0	9.0	6.0	6.0	6.0	8.0	9.0	9.0	9.0	9.0	7.0	
A20	4.5	4.5	4.5	6.5	6.5	4.5	4.5	6.5	4.5	4.5	4.5	4.5	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	3.5	4.5	4.5	6.5	6.5	4.5	4.5	4.5	5.5	6.5	6.5	6.5	4.5		
A21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.0	3.0	0.0	0.0	0.0	3.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0	
A24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0	
A28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	5.5	2.0	0.0	0.0	6.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A29	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.5	1.0	1.0	2.0	1.0	8.0	8.5	9.0	4.0	0.0	0.0	8.0	5.5	0.0	0.0	2.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	
A30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.5	3.0	0.0	0.0	9.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		
A31	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.5	1.0	1.0	2.0	1.0	9.0	9.5	10.0	4.0	0.0	0.0	9.0	6.5	0.0	0.0	2.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	
A32	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.5	1.0	1.0	2.0	1.0	9.0	9.5	10.0	4.0	0.0	0.0	9.0	6.5	0.0	0.0	2.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	
A33	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.5	1.0	1.0	2.0	1.0	9.0	9.5	10.0	4.0	0.0	0.0	9.0	6.5	0.0	0.0	2.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	
A34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	6.5	6.5	3.0	0.0	0.0	7.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0		

**Table A10.** Matrix of Weighted Valued Convergences of Objectives between Actors (3CAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	
A01	0.0	4.4	14.7	11.0	11.1	8.9	9.3	2.8	6.4	8.5	7.2	12.4	7.2	2.6	0.0	81.9	0.0	0.0	0.7	3.0	16.1	29.7	12.2	12.1	13.3	9.4	9.1	10.3	4.1	42.8	1.6	1.0	2.9	2.6	
A02	4.4	0.0	17.4	13.7	13.8	11.7	12.0	5.6	9.2	11.3	9.9	15.2	9.3	4.0	0.0	84.5	0.0	0.0	1.2	4.5	18.4	32.3	15.0	14.8	16.0	12.1	11.9	13.0	6.7	45.6	4.2	3.6	5.5	5.3	
A03	14.7	17.4	0.0	24.0	24.1	22.0	22.3	15.9	19.5	21.6	20.2	25.5	17.5	9.1	0.0	94.4	0.0	0.0	4.0	8.8	25.2	41.0	25.2	25.1	26.3	22.4	22.2	23.3	15.4	55.9	12.9	12.3	14.2	15.6	
A04	11.0	13.7	24.0	0.0	20.4	18.2	18.6	12.1	15.7	17.8	16.5	21.7	13.2	5.6	0.0	90.3	0.0	0.0	2.5	6.3	23.0	38.7	21.5	21.4	22.6	18.7	18.4	19.5	13.1	52.1	10.6	10.0	11.9	11.9	
A05	11.1	13.8	24.1	20.4	0.0	18.3	18.7	12.3	15.8	18.0	16.6	21.8	13.3	5.6	0.0	90.4	0.0	0.0	2.5	6.3	23.1	38.8	21.6	21.5	22.7	18.8	18.6	19.7	13.2	52.3	10.7	10.1	12.0	12.0	
A06	8.9	11.7	22.0	18.2	18.3	0.0	16.5	10.1	13.7	15.8	14.4	19.7	12.5	6.0	0.0	88.8	0.0	0.0	1.8	6.7	22.2	36.5	19.5	19.3	20.5	16.6	16.4	17.5	11.0	50.1	8.4	7.8	9.7	9.8	
A07	9.3	12.0	22.3	18.6	18.7	16.5	0.0	10.4	14.0	16.1	14.8	20.0	12.9	6.3	0.0	89.1	0.0	0.0	2.2	7.1	22.5	36.9	19.8	19.6	20.9	17.0	16.7	17.8	11.3	50.4	8.8	8.2	10.1	10.2	
A08	2.8	5.6	15.9	12.1	12.3	10.1	10.4	0.0	7.6	9.7	8.4	13.6	7.9	3.0	0.0	83.0	0.0	0.0	0.9	3.2	16.8	30.6	13.4	13.2	14.5	10.5	10.3	11.4	5.1	44.0	2.6	2.0	3.8	3.7	
A09	6.4	9.2	19.5	15.7	15.8	13.7	14.0	7.6	0.0	13.3	11.9	17.2	11.0	4.5	0.0	86.5	0.0	0.0	1.5	6.0	20.2	34.2	17.0	16.8	18.0	14.1	13.9	15.0	8.7	47.6	6.1	5.5	7.4	7.3	
A10	8.5	11.3	21.6	17.8	18.0	15.8	16.1	9.7	13.3	0.0	14.0	19.3	12.4	5.4	0.0	88.5	0.0	0.0	2.0	6.9	22.0	36.2	19.1	18.9	20.2	16.2	16.0	17.1	10.6	49.7	8.1	7.5	9.4	9.4	
A11	7.2	9.9	20.2	16.5	16.6	14.4	14.8	8.4	11.9	14.0	0.0	17.9	11.4	5.4	0.0	87.2	0.0	0.0	1.5	5.5	20.2	34.3	17.7	17.6	18.8	14.9	14.7	15.8	8.7	48.4	6.2	5.6	7.5	8.1	
A12	12.4	15.2	25.5	21.7	21.8	19.7	20.0	13.6	17.2	19.3	17.9	0.0	15.5	7.4	0.0	92.2	0.0	0.0	2.7	9.3	25.4	39.9	23.0	22.8	24.0	20.1	19.9	21.0	14.4	53.6	11.9	11.2	13.1	13.3	
A13	7.2	9.3	17.5	13.2	13.3	12.5	12.9	7.9	11.0	12.4	11.4	15.5	0.0	11.0	0.0	80.6	0.0	0.0	7.8	9.4	19.0	28.6	15.2	13.5	14.3	12.9	12.5	13.6	8.3	35.7	6.5	6.1	7.3	7.8	
A14	2.6	4.0	9.1	5.6	5.6	6.0	6.3	3.0	4.5	5.4	5.4	7.4	11.0	0.0	0.0	46.2	0.0	0.0	4.7	5.3	9.0	13.1	8.1	6.4	6.8	6.4	5.8	5.9	2.8	15.0	2.0	1.9	2.5	2.8	
A15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A16	81.9	84.5	94.4	90.3	90.4	88.8	89.1	83.0	86.5	88.5	87.2	92.2	80.6	46.2	0.0	0.0	0.0	0.0	35.9	40.2	82.0	105.9	92.0	91.2	92.3	89.2	89.0	90.1	81.2	119.6	79.0	78.4	80.1	82.7	
A17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A19	0.7	1.2	4.0	2.5	2.5	1.8	2.2	0.9	1.5	2.0	1.5	2.7	7.8	4.7	0.0	35.9	0.0	0.0	0.0	2.4	2.2	5.6	2.7	1.7	1.8	2.3	2.4	2.4	1.2	7.6	0.7	0.6	1.0	0.9	
A20	3.0	4.5	8.8	6.3	6.3	6.7	7.1	3.2	6.0	6.9	5.5	9.3	9.4	5.3	0.0	40.2	0.0	0.0	2.4	0.0	15.1	21.3	7.9	7.1	7.6	7.2	6.6	7.7	4.1	21.2	2.8	2.6	3.3	3.2	
A21	16.1	18.4	25.2	23.0	23.1	22.2	22.5	16.8	20.2	22.0	20.2	25.4	19.0	9.0	0.0	82.0	0.0	0.0	2.2	15.1	0.0	41.7	24.0	24.6	25.7	22.6	22.3	23.4	18.0	48.0	16.0	15.5	17.0	16.6	
A22	29.7	32.3	41.0	38.7	38.8	36.5	36.9	30.6	34.2	36.2	34.3	39.9	28.6	13.1	0.0	105.9	0.0	0.0	5.6	21.3	41.7	0.0	38.6	39.7	40.9	37.0	36.7	37.8	32.2	69.7	29.7	29.0	30.9	30.5	
A23	12.2	15.0	25.2	21.5	21.6	19.5	19.8	13.4	17.0	19.1	17.7	23.0	15.2	8.1	0.0	92.0	0.0	0.0	2.7	7.9	24.0	38.6	0.0	22.6	23.8	19.9	19.7	20.8	13.1	53.4	10.5	9.9	11.8	13.1	
A24	12.1	14.8	25.1	21.4	21.5	19.3	19.6	13.2	16.8	18.9	17.6	22.8	13.5	6.4	0.0	91.2	0.0	0.0	1.7	7.1	24.6	39.7	22.6	0.0	23.7	19.8	19.5	20.6	14.1	53.2	11.6	11.0	12.9	13.0	
A25	13.3	16.0	26.3	22.6	22.7	20.5	20.9	14.5	18.0	20.2	18.8	24.0	14.3	6.8	0.0	92.3	0.0	0.0	1.8	7.6	25.7	40.9	23.8	23.7	0.0	21.0	20.8	21.9	15.3	54.5	12.8	12.2	14.1	14.2	
A26	9.4	12.1	22.4	18.7	18.8	16.6	17.0	10.5	14.1	16.2	14.9	20.1	12.9	6.4	0.0	89.2	0.0	0.0	2.3	7.2	22.6	37.0	19.9	19.8	21.0	0.0	16.8	17.9	11.4	50.5	8.9	8.3	10.2	10.3	
A27	9.1	11.9	22.2	18.4	18.6	16.4	16.7	10.3	13.9	16.0	14.7	19.9	12.5	5.8	0.0	89.0	0.0	0.0	2.4	6.6	22.3	36.7	19.7	19.5	20.8	16.8	0.0	17.7	11.1	50.3	8.6	8.0	9.9	10.0	
A28	10.3	13.0	23.3	19.5	19.7	17.5	17.8	11.4	15.0	17.1	15.8	21.0	13.6	5.9	0.0	90.1	0.0	0.0	2.4	7.7	23.4	37.8	20.8	20.6	21.9	17.9	17.7	0.0	12.2	51.4	9.7	9.1	11.0	11.1	
A29	4.1	6.7	15.4	13.1	13.2	11.0	11.3	5.1	8.7	10.6	8.7	14.4	8.3	2.8	0.0	81.2	0.0	0.0	1.2	4.1	18.0	32.2	13.1	14.1	15.3	11.4	11.1	12.2	0.0	44.1	4.2	3.6	5.5	5.0	
A30	42.8	45.6	55.9	52.1	52.3	50.1	50.4	44.0	47.6	49.7	48.4	53.6	35.7	15.0	0.0	119.6	0.0	0.0	7.6	21.2	48.0	69.7	53.4	53.2	54.5	50.5	50.3	51.4	44.1	0.0	41.6	41.0	42.9	43.7	
A31	1.6	4.2	12.9	10.6	10.7	8.4	8.8	2.6	6.1	8.1	6.2	11.9	6.5	2.0	0.0	79.0	0.0	0.0	0.7	2.8	16.0	29.7	10.5	11.6	12.8	8.9	8.6	9.7	4.2	41.6	0.0	1.0	2.9	2.5	
A32	1.0	3.6	12.3	10.0	10.1	7.8	8.2	2.0	5.5	7.5	5.6	11.2	6.1	1.9	0.0	78.4	0.0	0.0	0.6	2.6	15.5	29.0	9.9	11.0	12.2	8.3	8.0	9.1	3.6	41.0	1.0	0.0	2.3	1.9	
A33	2.9	5.5	14.2	11.9	12.0	9.7	10.1	3.8	7.4	9.4	7.5	13.1	7.3	2.5	0.0	80.1	0.0	0.0	1.0	3.3	17.0	30.9	11.8	12.9	14.1	10.2	9.9	11.0	5.5	42.9	2.9	2.3	0.0	3.7	
A34	2.6	5.3	15.6	11.9	12.0	9.8	10.2	3.7	7.3	9.4	8.1	13.3	7.8	2.8	0.0	82.7	0.0	0.0	0.9	3.2	16.6	30.5	13.1	13.0	14.2	10.3	10.0	11.1	5.0	43.7	2.5	1.9	3.7	0.0	

**Table A11.** Matrix of Weighted Valued Divergences of Objectives between Actors (3DAA). Extracted from MACTOR Software version 5.1.2.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	
A01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	2.0	0.0	8.7	0.0	0.0	1.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0		
A02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	2.7	0.0	8.9	0.0	0.0	2.1	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.2	0.2	0.0		
A03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	4.7	0.0	9.3	0.0	0.0	4.2	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	1.8	1.7	1.8	0.0		
A04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	5.3	0.0	9.6	0.0	0.0	4.8	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3	0.3	0.4	0.0		
A05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	5.3	0.0	9.7	0.0	0.0	4.8	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3	0.3	0.4	0.0		
A06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	3.9	0.0	9.1	0.0	0.0	3.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.4	0.5	0.0		
A07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	3.9	0.0	9.1	0.0	0.0	3.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.4	0.5	0.0		
A08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	2.4	0.0	8.9	0.0	0.0	1.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.2	0.3	0.0		
A09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.0	0.0	8.9	0.0	0.0	2.5	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.2	0.3	0.0		
A10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	3.7	0.0	9.1	0.0	0.0	3.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.4	0.4	0.0		
A11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	3.3	0.0	9.0	0.0	0.0	2.8	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.9	0.9	1.0	0.0		
A12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	4.5	0.0	9.2	0.0	0.0	3.9	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.5	0.5	0.6	0.0		
A13	2.9	3.6	5.6	6.2	6.3	4.9	4.8	3.3	3.9	4.6	4.2	5.4	0.0	0.0	0.0	18.5	0.0	0.0	0.0	0.0	2.9	9.0	5.4	7.0	7.4	4.9	5.0	5.1	4.4	15.6	3.5	3.3	4.1	3.2	
A14	2.0	2.7	4.7	5.3	5.3	3.9	3.9	2.4	3.0	3.7	3.3	4.5	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0	3.0	8.1	4.5	6.1	6.5	4.0	4.1	4.2	3.2	14.7	2.4	2.2	2.9	2.3	
A15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A16	8.7	8.9	9.3	9.6	9.7	9.1	9.1	8.9	8.9	9.1	9.0	9.2	18.5	18.6	0.0	0.0	0.0	0.0	18.1	18.3	0.0	9.9	9.2	9.9	10.0	9.1	9.2	9.2	12.0	12.2	11.7	11.6	11.9	8.9	
A17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A19	1.5	2.1	4.2	4.8	4.8	3.4	3.4	1.9	2.5	3.1	2.8	3.9	0.0	0.0	0.0	18.1	0.0	0.0	0.0	0.0	2.5	7.6	4.0	5.5	6.0	3.4	3.6	3.6	2.3	14.1	1.5	1.4	2.0	1.7	
A20	1.0	1.6	3.2	3.4	3.5	2.6	2.6	1.3	1.8	2.4	2.1	3.0	0.0	0.0	0.0	18.3	0.0	0.0	0.0	0.0	2.7	5.9	3.1	4.0	4.3	2.6	2.7	2.8	1.5	10.2	1.1	0.9	1.4	1.1	
A21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.0	0.0	0.0	0.0	0.0	2.5	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
A22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	8.1	0.0	9.9	0.0	0.0	7.6	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	4.5	0.0	9.2	0.0	0.0	4.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	1.6	1.6	1.7	0.0	
A24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	6.1	0.0	9.9	0.0	0.0	5.5	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.4	0.5	0.0	
A25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	6.5	0.0	10.0	0.0	0.0	6.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.4	0.5	0.0	
A26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	4.0	0.0	9.1	0.0	0.0	3.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.4	0.5	0.0	
A27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	4.1	0.0	9.2	0.0	0.0	3.6	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.5	0.5	0.5	0.0	
A28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	4.2	0.0	9.2	0.0	0.0	3.6	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.5	0.5	0.5	0.0	
A29	0.2	0.3	1.8	0.4	0.4	0.5	0.5	0.3	0.3	0.5	1.0	0.6	4.4	3.2	0.0	12.0	0.0	0.0	2.3	1.5	0.0	0.0	1.7	0.5	0.5	0.5	0.6	0.6	0.0	1.3	0.0	0.0	0.0	0.2	
A30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	14.7	0.0	12.2	0.0	0.0	14.1	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.2	1.2	1.2	0.0	
A31	0.1	0.2	1.8	0.3	0.3	0.4	0.4	0.2	0.3	0.4	0.9	0.5	3.5	2.4	0.0	11.7	0.0	0.0	1.5	1.1	0.0	0.0	1.6	0.4	0.5	0.4	0.5	0.5	0.0	1.2	0.0	0.0	0.0	0.1	
A32	0.0	0.2	1.7	0.3	0.3	0.4	0.4	0.2	0.2	0.4	0.9	0.5	3.3	2.2	0.0	11.6	0.0	0.0	1.4	0.9	0.0	0.0	1.6	0.4	0.4	0.4	0.5	0.5	0.0	1.2	0.0	0.0	0.0	0.1	
A33	0.1	0.2	1.8	0.4	0.4	0.5	0.5	0.3	0.3	0.4	1.0	0.6	4.1	2.9	0.0	11.9	0.0	0.0	2.0	1.4	0.0	0.0	1.7	0.5	0.5	0.5	0.5	0.5	0.0	1.2	0.0	0.0	0.0	0.1	
A34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	2.3	0.0	8.9	0.0	0.0	1.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.1	0.0		

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