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NEWTON NYAMASEGE MARUBE

A CONSTRUCTIVIST MULTI-CRITERIA DECISION AID APPROACH FOR PERFORMANCE EVALUATION OF THE SUPPLY CHAIN MANAGEMENT OF PUBLIC HEALTH CARE: CONSTRUCTION OF AN EVALUATION MODEL

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Dissertation presented to the Professional Master's Program in Public Administration in National Network - PROFIAP of the Federal University of Rio Grande - FURG as a partial requirement to obtain the Master's degree in Public Administration.

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UMA METODOLOGIA CONSTRUTIVISTA DE APOIO A DECISÃO PARA AVALIAÇÃO DE DESEMPENHO DA GESTÃO DA CADEIA DE SUPRIMENTOS DE UM HOSPITAL PÚBLICO: CONSTRUÇÃO DE UM MODELO DE AVALIAÇÃO

Dissertação apresentada ao Programa de Pós-Graduação em Administração Pública em Rede da Universidade Federal do Rio Grande como parte dos requisitos para obtenção do grau de Mestre em Administração Pública.

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Dedicated to the memory of Leila Mara Barbosa Costa Valle, without whom this work would not have been possible. It is through your sense of understanding and guidance that I am where I am today. You are gone but your belief in me has made this journey possible!

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"If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle."

(Sun Tzu)

ABSTRACT

Society has increasingly demanded efficient public services and of better quality. The current public administration has the challenge of meeting these requirements, for which it has increasingly been adopting practices and methodologies used in the private sector. In this context, performance evaluation emerges as an important management tool capable of helping to improve the public service. Supply chain operation costs currently account for up to 45% of the annual operating expenses of health care organizations. Performance evaluation and its application in specific functional areas, such as Supply Chain Management (SCM), can provide an opportunity to curtail the ever-increasing health care costs. An efficient supply chain management creates value for both organizations and for their various partners who interact throughout the global supply chain. The objective of this study is to build a performance evaluation model of the supply chain management of a public teaching hospital. To achieve this goal, the Multicriteria Decision Aid - Constructivist methodology (MCDA-C) was selected. Through a structured interview with the HU-FURG/EBSERH administrative manager, 160 criteria were identified as relevant and sufficient to evaluate the performance of the supply chain management. These criteria originated from eleven areas of concern, namely: "Administration" , "Budget and Finance", "Hospital Infrastructure", "Information technology", "Teaching", "Purchases", "Logistics", "Politics", "Legislation", "Planning", and "Human Resources management". In addition, the application of the result of this research made it possible to carry out a global assessment of the current situation, on a scale of 0 to 100, with the object of study reaching a value of 51.55. Based on the results obtained through the determination of the compensation rates and the overall assessment of the model, improvements were proposed to improve the performance of aspects at compromising levels and the implementation of the proposed improvements actions will allow the performance of the supply chain management to increase from 51.55 to 76.25 points. It is emphasized that the present study is based on the construction of a performance evaluation tool from a constructivist point of view, based mainly on the visions, beliefs, contexts and opinions of the actors involved and not on specialists or alternatives given by scientific literature.

Keywords: Supply chain management, health care, public sector, Performance evaluation, Decision support systems, MCDA-C;

RESUMO

Cada vez mais a sociedade tem exigido serviços públicos eficientes e de melhor qualidade. A atual administração pública tem o desafio de atender a esses anseios, para os quais cada vez mais vem adotando práticas e metodologias utilizadas no setor privado. Nesse contexto, a avaliação de desempenho surge como uma importante ferramenta de gestão capaz de ajudar a melhorar o serviço público. Os custos de operação da cadeia de suprimentos atualmente representam até 45% das despesas operacionais anuais das organizações de saúde. A avaliação de desempenho e sua aplicação em áreas funcionais específicas, como na gestão da cadeia de suprimentos, podem proporcionar uma oportunidade para reduzir os custos cada vez maiores dos serviços de saúde. Uma gestão eficiente da cadeia de suprimentos cria valor para as organizações e para os vários parceiros que interagem por toda a cadeia global. O objetivo deste estudo é construir um modelo de avaliação de desempenho da gestão de toda cadeia de suprimentos de um hospital público de ensino. Para atingir esse objetivo, foi escolhida a metodologia Multicritério de Apoio à Decisão - Construtivista (MCDA-C). Por meio de entrevistas estruturada com o gerente administrativo do HU-FURG/EBSERH, foram identificados 160 critérios relevantes e suficientes para avaliar o desempenho da gestão da cadeia de suprimentos. Estes critérios originaram-se de onze áreas de preocupação, a saber: "Administração", "Orçamento e Finanças", "Infraestrutura Hospitalar", "Tecnologia da Informação", "Ensino", "Compras", "Logística", "Política", "Legislação", "Planejamento" e "Gestão de Recursos Humanos". A aplicação do resultado desta pesquisa possibilitou a realização de uma avaliação global da situação atual, e em uma escala de 0 a 100, o objeto de estudo atingiu um valor de 51,55. Foi verificada similaridade entre alguns indicadores da literatura e do modelo, enquanto que os restantes vieram da construção do modelo *ad hoc*. Com base nos resultados obtidos através da determinação das taxas de compensação e da avaliação global do modelo, foram propostas ações para melhorar o desempenho dos aspectos em níveis comprometedores e a implementação das ações de melhorias propostas permitirá que o desempenho da gestão da cadeia de suprimentos aumente de 51,55 para 76,25 pontos. Ressalta-se que o presente estudo se fundamenta na construção de uma ferramenta de avaliação de desempenho do ponto de vista construtivista, baseada principalmente nas visões, crenças, contextos e opiniões dos atores envolvidos e não em especialistas ou alternativas dadas pela literatura científica.

Palavras-chave: Gestão da cadeia de suprimentos, saúde, setor público, Avaliação de desempenho, Sistemas de apoio à decisão, MCDA-C;

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LIST OF ABBREVIATIONS AND ACRONYMS

AHP - Analytic Hierarchy Process

ANFIS - Adaptive Neuro-Fuzzy Inference System

APICS - American Production and Inventory Control Society

BP – Bibliographic Portfolio

BSC - Balanced Scorecard

CFM - Conselho Federal de Medicina

CNES - Cadastro Nacional de Estabelecimentos de Saúde

CSCMP - Council of Supply Chain Management Professionals

DEA - Data Envelopment Analysis

DEMATEL - Decision-Making Trial and Evaluation Laboratory

EBSERH - Empresa Brasileira de Serviços Hospitalares

ENAP - Escola Nacional de Administração Pública

EPV – Elementary Points of View

FPV - Fundamental Points of View

GNP - Gross National Product

HSV – Hierarchuical Structure of Value

KPI – Key Performance Indicators

MACBETH - Measuring Attractiveness by a Categorical Based Evaluation Technique

MCDA - Multiple-Criteria Decision Analysis

OECD - Organization for Economic Co-operation and Development

OR – Operations Research

PEE - Primary Evaluation Elements

ProKnow-C - Knowledge Development Process – Constructivist

SCM – Supply Chain Management

SCOR - Supply Chain Operations Reference

SUS - Sistema Único de Saúde

TH – Teaching Hospital

WHO - World Health Organization

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1 INTRODUCTION

The growing demand for health services leads to a more than necessary shift in the relationship between effectiveness and complexity in health institutions. At a time when public budgets are under pressure around the world, it is alarming that around 20% of health spending contributes minimally or does not contribute in any way to good health outcomes (OECD, 2017). Data show that the greatest health problem not only lies in the scarcity of financial resources, but also in the wastage, pointed out as the main cause of the current health crisis. According to the World Health Organization (World Health Organization, 2010), between 20% and 40% of all health spending is wasted due to inefficiency.

When one refers to inefficiency due to wastage, the supply chain is pointed out as the main area in which this inefficiency can be tackled. According to the Supply Chain Management Professionals Council (CSCMP), supply chain management encompasses the planning and management of all activities involved in bids and acquisitions and in all logistics management activities, it also includes coordination and collaboration with other partners, who may be suppliers, intermediaries, third-party service providers and customers. In essence, supply chain management integrates supply and demand management within the company and between companies (CSCMP, 2018) and if executed appropriately, it solves the problem of inefficient use of resources.

In Brazil, public hospitals and the Unified Health System (SUS) in specific are responsible for 70% of national hospital care (CNES, 2017). There are 193 certified teaching hospitals, and among these, 47 are federal teaching hospitals (THs). THs represent a privileged space for the convergence of health care with teaching, research, outreach and technological development with high social responsibility (Nogueira, Lira, Albuquerque, & Linhares, 2015). They are responsible for high complexity health services and the training of physicians and the uniqueness of the health process and their social and economic relevance implies an intense flow of materials, information, professionals and patients (Barata, Mendes, & Bittar, 2010).

According to the Federal Medical Council, THs are responsible for up to 10% of hospital admissions throughout the country and for almost half of the procedures of medium and high complexity of the Brazilian Unified Health System (SUS). Most THs are presenting financial difficulties, a result of a crisis that has disrupted services and care in recent years.

Budget cuts, due to a shift in the political agenda, are one of the major causes of the problems faced by these institutions. In 2015, for example, the reduction in the budget was almost R$ 550 million in the 50 university hospitals of the federal network. The total investment was 7% lower than that applied to these units in the previous year (CFM, 2017).

The lack of accurate real-time information, standardized administrative procedures as well as problems related to materials, budget and finance require better management practices to regulate and facilitate the SCM operations of all organizational areas of these institutions responsible for providing qualified services (Leonardo Ensslin, Ensslin, Dutra, Longaray, & Dezem, 2018). SC operations in the healthcare consist of the planning, organization and coordination of hospital activities so that efficiency is guaranteed in the care and use of the inputs, besides exercising greater control over the costs and ensuring the safety of procedures.

Hospital administration is responsible for the maintenance, monitoring of relationships with suppliers, and establishing contact with funding sources, staff and patients, as well as controlling hospital beds and inventory management, not to mention the supply chain management of materials and medicines. In practice, material management involves receiving, verifying and addressing, verifying expiration dates, and batches. In addition, the hospital cannot run out of the necessary supplies, while avoiding waste at all costs.

In this scenario, it is necessary to develop scientific instruments that support supply chain management, allowing the public hospital to be managed better, controlling the use of inputs to reduce costs, avoid material and drug waste, eliminate product obsolescence, as well as meet the demand of excellent service. All this at a time when consumption costs account for 50% of the total hospital cost in Brazil (Paschoal & Castilho, 2010), while in developed countries, such as the United States, this cost is about 30% (Minahan, 2007). Hospital logistics is pointed out as an area where costs can be reduced and efficiencies can be attained to deliver care at a reasonable cost. Estimates of the potential benefit of an efficiently managed health care supply chain have ranged from 2% to 8% of hospital operating costs (McKone-Sweet, Hamilton, & Willis, 2005).

It is against this background that the present research is set. In an environment that consists of a variety of health care stakeholders: caregivers, patients, regulatory agencies, physician groups, insurers and governments (municipal, state and federal) as well as a variety of other organizations (Ryan, 2005). These stakeholders mean many decision makers, whose economic structures, and hence objectives, differ and in many cases conflict with each other.

The effective organization and management of a health care delivery system requires careful management of resources to ensure that the necessary staff and equipment are in the right place at the right time. The problem is complicated by uncertainties and system complexity. Both supply and demand for services are uncertain in different ways, making it very difficult to match supply to demand. This task is complicated because demand for services is determined, for example, by both available technology (i.e., available treatments) and financial considerations, among other factors characteristic of the public health system.

Decisions made by one party often affect the options available to other parties, as well as the costs of these options, in ways that are not well understood. Given the complexity, confusion, conflicting interests and uncertainties involved in such context, the whole process involves several areas of the institution, includes the relationship with the entire supply chain and still needs to respect the legal rules of the places where the organization operates. Uncertainty and risk are aspects inherent in all supply chains. Customer demand can never be accurately predicted, transportation times are never fully defined and there is always the possibility that the machines and vehicles will stop working.

Similarly, recent industrial trends, including outsourcing, offshore production and lean production, aimed at reducing the costs of the supply chain, significantly increase the level of risk in the supply chain. Thus, supply chains need to be designed and managed to eliminate as much uncertainty and risk as possible, in addition to efficiently dealing with remaining uncertainties and risks. However, almost all of these complicating factors are also present, to one degree or another, in industrial supply chains; the progress made in understanding these systems in the last several decades is a cause for hope that some insights and modeling tools developed in the industrial domain can be applied to at least some aspects of health care delivery systems (Uzsoy, 2005).

Performance evaluation is one of these tools, and has been used to aid decision making in several contexts such as health (Leonardo Ensslin et al., 2018), agriculture (Leonardo Ensslin, Vinícius Dezem, Ademar Dutra, Sandra Rolim Ensslin, & Karine Somensi, 2017), waste management (Rodrigues et al., 2018), urban services (Thiel, Ensslin, & Ensslin, 2017), human resource management, (S. Ensslin, Ensslin, Back, & Lacerda, 2013), just to name a few. Nevertheless, the sophisticated and dynamic feature of health care supply chain management makes performance evaluation more difficult (Burns, 2002).

By virtue of competition, private entities have evolved significantly in relation to performance appraisal methodologies; public management on the other hand has gone the other way. Often, for political reasons, there is no interest in showing performance, overshadowing accountability. It is then up to society to demand transparency in management from government agents (Bonacim & de Araujo, 2009).

In this sense, literature has pointed to the importance of the adoption of the Performance Evaluation (PE) process to identify the necessary and sufficient aspects during the management of conflicts, complex and uncertain. Furthermore, performance evaluation has been considered a fundamental process in that it makes it possible to monitor and improve the evaluated aspects (Leonardo Ensslin et al., 2018).

The notion of performance evaluation adopted in the present study follows the formulation by Ensslin, Ensslin, Back and Lacerda (2013, p. 739) where:

> […] performance evaluation is a process to develop knowledge for a decision maker that is relevant to the specific context that he or she intends to evaluate. This is conducted through activities that identify, organize, and measure ordinally and cardinally the key performance factors, which allow the decision maker to understand the consequences of actions.

Performance evaluation is seen as a decision aid tool and draws attention to the necessity of enhancing the decision-maker's understanding of his decision context and the consequences of his decisions in each of his strategic, tactical and operational, individual and global strategies, contemplating improvement actions in a continuous management process. This has been studied by (Leonardo Ensslin, Dutra, & Ensslin, 2000; Leonardo Ensslin, Neto, & Noronha, 2001; Roy, 1993),

To support the SCM operations in healthcare, we first need to know what has been disseminated in the scientific community. To this end, it is necessary to conduct a detailed review of what has been published on the theme. This study applies a systematic literature review with the use of the Knowledge Development Process - Constructivist, referred to as 'ProKnow-C', (Afonso, Souza, Ensslin, & Ensslin, 2011; Leonardo Ensslin et al., 2018; Leonardo Ensslin, Ensslin, & Pacheco, 2012; Pinto et al., 2018)

ProKnow-C is a systematic approach to organize knowledge from a literature review, and comprises four main steps: elaboration of bibliographic portfolio; bibliometric analysis, systemic analysis and identification of a research question that represents an search opportunity in the literature for further research (Thiel et al., 2017). The knowledge generated in the process, aided by the critical analysis of literature enables the facilitator to conduct the process of identifying the values and preferences of the decision maker during the construction of the model. After this process, the researcher has the necessary know-how to use the second intervention tool, MCDA-C, to construct a performance evaluation model based on the values and preferences of the decision maker.

Therefore, the overarching research question this study seeks to address is how a constructivist performance evaluation model that supports the supply chain management of a public hospital can be operationalized.

1.1 OBJECTIVES

The general objective of the present study is to develop a constructivist performance evaluation model that supports the management of the supply chain of a public hospital.

In order to achieve the general objective, the following specific objectives were established:

(i) Revision of the literature on the performance evaluation of supply chain management focused on public-sector health care;

(ii) Review the concepts and applications of multi-criteria methods in health care sector;

(iii) Identify and measure the necessary and sufficient criteria to evaluate the performance of public management of the HU-FURG/EBSERH supply chain;

(iv) Identify the global performance evaluation of HU-FURG/EBSERH supply chain management, the overall view of the model and propose improvement in those criteria where performance failed to meet manager expectations.

1.2 RATIONALE AND SIGNIFICANCE

The rationale for carrying out this research is based on theoretical and practical contributions to the field of performance evaluation of public-sector supply chains, specifically in healthcare.

The theoretical contribution is characterized by the bibliometric revision of the literature on the performance evaluation of supply chain management focused on public-sector healthcare, making it possible to identify the main articles, journals and authors of the theme under study along with the most used terms that compose the keywords of these studies. The systemic and structured analysis of this literature allows for knowledge construction and highlights the research gaps left by authors on this theme. It also permits the identification of the performance indicators found in the literature.

The methodological proposal constructed to aid managers involved in decision-making processes in public-sector supply chain management is also an important contribution of this study.

The practical contribution will be perceived in the application of the performance evaluation model in the management of a public hospital supply chain, allowing the enhancement of the decision-maker's knowledge of the context under analysis, to build management performance indicators, and to carry out the overall performance assessment, finally indicating management improvement actions.

The relevance of this study is attenuated by the complex nature of public-sector performance evaluation and the need for new research related to public healthcare as perceived in the literature. Furthermore, the constructivist approach to be used in the present study presents a new perspective in the construction of performance evaluation models that focus on public-sector healthcare supply chain management, unprecedented in literature, as it will be observed in the literature analysis.

1.3 RESEARCH DELIMITATION

The present work draws attention to possible delimitations to be encountered during its execution. These are either by factors such as time and resources, in addition to the method itself. The study on performance evaluation of the supply chain management of a public hospital, will be carried out using a constructivist methodology, which takes into account the perceptions and values of the decision-maker on the specific context under study, restricting the generalization of such research of the model constructed in the present research. Stake affirms that, single or a few cases are a poor representation of a population of cases and questionable grounds for advancing grand generalization (Stake, 2008). However, the methodological contribution used for the construction of the model can be applied in future work on performance evaluation of SCM in public healthcare.

Another delimitation refers to the bibliographic search, which is restricted to articles accessible in journals that have unrestricted full text access through the Portal of Periodicals of the Coordination for the Improvement of Higher Education Persons (CAPES) or open access, i.e., incomplete articles, articles from others sources or other types of media were excluded during the execution of the present research.

Finally, yet importantly, the analysis of the articles found in the research, through ProKnow-C, using the three axes of research (performance evaluation, public hospitals and SCM) details the knowledge production at the intersection of the three axes, searching for papers that contributed to the study theme as a whole. This way, the research does not enter into the individual aspects of each research axis, nor does it analyze works not identified by the methodology adopted herein, for the purposes of the theoretical reference.

1.4 DISSERTATION STRUCTURE

The present dissertation is organized in six chapters, followed by the references and structured as follows: Chapter 1 presents an introduction of the research topic, research question, the objectives, rationale and significance and the research delimitation. Chapter 2 brings the conceptual framework, covering background information on supply chain management and performance evaluation. It is broken down to SCM in the public sector and the health care supply chain performance evaluation in general, and healthcare to be specific. This is followed by Chapter 3, which details the research design adopted, showing the methodological framework and presenting the two instruments of intervention applied: ProKnow-C and MCDA-C methodology. Chapter 4 presents the results of the knowledge development process, entailing the portfolio selection, bibliometric analysis and systemic analysis of the Bibliographic Portfolio articles found in literature, according to the delimitations of the researcher. The construction of the Performance evaluation through the three MCDA-C stages is presented in chapter 5 and the conclusion of the present study is found in chapter six.

2 CONCEPTUAL FRAMEWORK

In this section, the conceptual framework by which the dissertation will be developed is presented. The conceptual framework of a study consists of the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs one's research. It is a key part of a research (Miles & Huberman, 1994; Robson, 2011). Miles and Huberman (1994) define a conceptual framework as a visual or written product, that explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables—and the presumed relationships among them.

The most important thing to understand about the conceptual framework is that it is primarily a conception or model of what is out there that the researcher plans to study, and of what is going on with these things and why—a tentative theory of the phenomena that is being investigated. The function of this theory is to inform the rest of the research, helping to assess and refine goals, develop realistic and relevant research questions, select appropriate methods, and identify potential validity threats to conclusions.

Initially, supply chain management is addressed with focus on the public sector and healthcare. Performance Evaluation follows next, focusing on the public sector, on healthcare and on the supply chain management. Subsequently, the process used in order to select a scientifically relevant theoretical reference for the subject and its bibliometric and systemic analysis is presented.

2.1 SUPPLY CHAIN MANAGEMENT

The supply chain consists of a concept that covers the entire logistic process of a particular product or service, from the manufacturing process (raw material) up to delivery to the final consumer. The supply chain can be understood as an interconnected business network, involving manufacturers, distributors, retailers, and consumers. It covers storage as well as all the movement of the raw material, from its point of origin to its point of consumption. The supply chain connects and aligns the activities of production, storage and transportation, aiming at the reduction of costs and cycles, in order to maximize the value perceived by the final customer. Supply chain management has become increasingly important in companies, since presently, chain-to-chain competition is more dominant than the firm-to-firm concept that existed before (Christopher, 2016; Conceição & Quintão, 2004; Pigatto & Alcantara, 2007).

The many supply chain definitions available in current literature means that there is no consensus in the industry as to what a supply chain is. Lummus and Alber (1997) define the supply chain as a network of entities through which material flows. Those entities may include suppliers, carriers, manufacturing sites, distribution centers, retailers, and customers (Lummus & Alber, 1997).

Chopra and Meindl define the supply chain as consisting of all parties involved, directly or indirectly, in fulfilling a customer request, it includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even the customers themselves (Chopra & Meindl, 2016).

A supply chain, as per Harrison and Van Hoek (2008), is a network of partners who collectively convert a basic commodity (upstream) into a finished product (downstream) that is valued by end-customers, and who manage returns at each stage (Harrison & Van Hoek, 2008). The APICS Dictionary on the other hand defines it as the global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution, and cash (Pittman et al., 2016).

Besides defining the supply chain, several authors have further defined the concept of supply chain management. The APICS Dictionary, 15th edition, defines supply chain management as “the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally,” (Pittman et al., 2016).

Cooper and Ellram (1993) defined supply chain management as “an integrating philosophy to manage the total flow of a distribution channel from supplier to ultimate customer” (Cooper & Ellram, 1993).

According to the Council of Supply Chain Management Professionals (CSCMP), “supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies” (CSCMP, 2018).

Christopher (2016) defines SCM as the management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole (Christopher, 2016).

According to Monczka et al. (2015), supply management is the strategic approach to planning for and acquiring the organization's current and future needs through effectively managing the supply base, utilizing a process orientation in conjunction with cross-functional teams (CFTs) to achieve the organizational mission (Monczka, Handfield, Giunipero, & Patterson, 2015).

Without the adoption of a uniform agreed upon definition of a supply chain, the same may apply to its management. Stock and Boyer (2009) state that researchers and practitioners will not be able to "advance the theory and practice" of the discipline without a consensus. In their study, they identified 166 definitions of SCM, (Stock & Boyer, 2009).

The World Bank defines the basic function of SCM as the managing and coordinating all of the supply chain activities necessary to support the organization's strategy of getting the right quantity of the product to the right place at the right time. In the case of the healthcare sector, this includes sourcing, procurement, transport, warehousing and treatment of patients. It also includes coordination and collaboration with channel partners, which can be funders, suppliers, intermediaries, third-party service providers, and customers. Supply chain management usually includes supply chain planning, a process of analyzing, evaluating and defining the supply chain strategies, including network design, sourcing, transportation and inventory policy (Raja & Hick, 2009).

Regardless of the definition or supply chain perspective used, one should recognize that supply chains are composed of interrelated activities that are internal and external to a firm. These activities are diverse in their scope; the participants who support them are often located across geographic boundaries and often come from diverse cultures (Monczka et al., 2015).

In the present study, the author brings only a few definitions to illustrate what encompasses SCM, something considered important for the rest of this dissertation.

For the purposes of this dissertation, supply chain management is defined as the management of a network of relationships within an organization and between interdependent organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances and information from the original producer to the final customer with the benefits of adding value, maximizing profitability through efficiencies, and achieving customer satisfaction (Stock & Boyer, 2009).

2.1.1 Public sector Supply chain management

Public sector SCM is a concept that offers a reference framework for the composition of public sector supply chains and multilevel networks. Actors in public sector supply chain comprise (1) private firms, which receive orders from public sector agents, (2) accounting officers and (3) policy-makers. The SCM in the public sector not only concentrates on the question, which institutions cooperate in goods and services, but also how these enterprises are involved with enterprises operating at other levels. Thus, analyses of intra-network-relationships as well as analyses of inter-network-relationship are essentially necessary elements of the concept (Migiro & Ambe, 2008).

Governments are generally the largest consumers of goods and services. To meet their objectives, their supply chain management (SCM) must thus ensure good quality, efficiency and cost-effective delivery. Financial activity in the public sector may account for up to 30% of the GNP in the US and as much as 14-20% of the GDP in Europe (Angelo Mori & Doni, 2010; Callender & Matthews, 2000). Consequently, effective supply chain management can lead to significant cost savings.

The entire government effort to improve the quality of current spending on goods and services used in the public sector must go through the modernization of the supply chain management (Tridapalli, Fernandes, & Vieira Machado, 2011).

There is a growing concern about the efficient use of public resources in the Brazilian government, resulting in initiatives aimed at controlling spending on purchases and contracting. However, according to ENAP (2002), there is a lack of direction for supply areas that really bring about fundamental changes, both in the methods for procuring, acquiring, using, storing and controlling consumer goods, as well as providing timely information, for decision making (ENAP, 2002).

SCM in the public sector differs from government sector-to-sector. In the health sector, for example, the focus may be more on logistics and the effective movement of goods and services in and out of hospitals whereas SCM in the education sector may focus on streamlining the chain through which teaching materials are delivered to students. The shape of the supply chain and the supply chain management processes employed will therefore vary considerably depending on a range of different considerations (OGC, 2005).

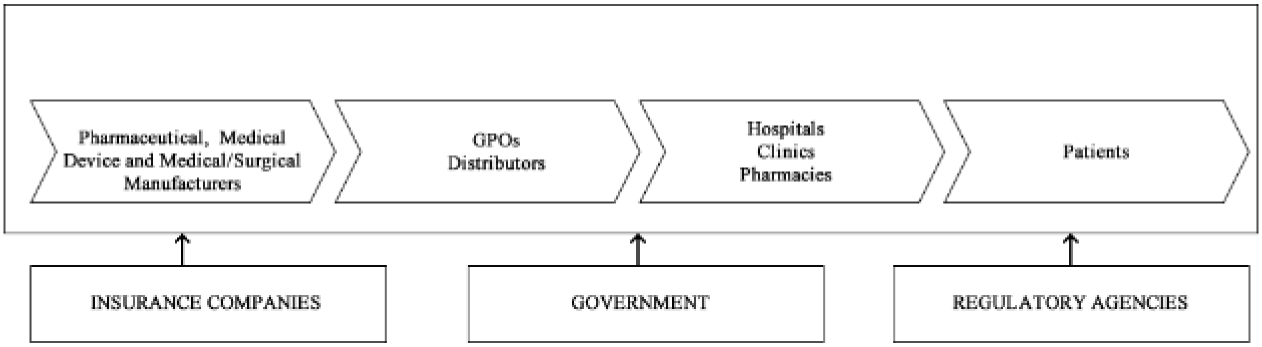
Public supply chain may be inbound into the public sector i.e., an operational requirement for internal customers and may be outbound from the public sector to deliver wider organizational objectives to provide services for delivery to citizens, or a combination of both. Supply chain is inbound to the public sector where suppliers deliver goods and services into the public-sector departments to support their operational objectives e.g. office furniture provision. While it is outbound from the public sector – directly supporting the needs of the public e.g. suppliers delivering training services for public sector funded projects (Migiro & Ambe, 2008).

2.1.2 Hospital supply chain management

The global healthcare industry is one of the world's largest and fastest growing industries, comprising various sectors: medical equipment and supplies, pharmaceutical, healthcare services, biotechnology, and alternative medicine sectors. Materials and logistics are, along with human resources and financial management, critical factors for the development of health care activities and operational excellence of the healthcare organization (Neil, 2004).

With extreme pricing pressures on today's healthcare providers, delivering high-quality medical care while reducing costs is a top strategic priority. To achieve this objective, health care service provider efforts have been focused primarily on eliminating wastage in clinical operations. While these are valid and important ways to reduce healthcare costs, supply chain management (SCM) becomes a high management concern as it costs as much as 40 percent of a typical hospital's operating budget, the second-largest expense for hospitals after labor (Darling & Wise, 2010). When it comes to expenses, supplies are second only to labor, with millions of products moving along the supply chain every day through manufacturers, distributors, Group Purchase Organizations (GPOs) and healthcare providers to patients. The figure below shows a simple illustration of a hospital supply, as suggested by Burns (2002).

Figure 1 - Schematic diagram of a hospital supply chain



Source: Adapted from (Burns, 2002)

The role of producers is to manufacture medical products such as surgical supplies, medical devices and pharmaceuticals. Purchasers include distributors, wholesalers and GPOs. Distributors and wholesalers hold inventory for producers to facilitate delivery of products. GPOs sign purchasing contracts with producers in order to achieve economies of scale by aggregating the volume of member providers. Health care providers represent those at the end of the supply chain with the function to serve patients and include, among others, hospitals, integrated delivery networks (IDNs), physicians, clinics, nursing homes and pharmacies (Burns, 2002).

The practices of supply chain management in the healthcare setting are almost by definition related to organizational aspects like building relationships, allocating authorities and responsibilities, and organizing interface processes.

2.1.3 Supply chain management in public hospitals

The public nature of hospital materials leads to lack of internal cost pressure and external efficiency motive, therefore many problems are evident in the public healthcare supply chain – the sluggish prediction of medical material demand as well as the patient-oriented response plan, ineffective information communication and coordination between supply and demand of materials and services, inadequate standardization of the management process, and the unreasonable external purchase, storage and distribution of materials (G.-s. Chen, 2010).

2.2 PERFORMANCE EVALUATION

Scientific literature on performance measurement is divided into two phases. The first phase emerged in the late 1880s and lasted until the 1980s. In this period, because of increased industrialization, the organizational performance measurement emphasized financial measures such as profit and revenue, and productivity (Ghalayini & Noble, 1996).

The second phase emerged because of increasing complexity in organizations, changes and sophistication of the world market and increasing competition. This phase emphasized non-financial measures to overcome the limitations of just using financial performance measures (Medori & Steeple, 2000).

There are many advantages of using non-financial measures: they are more timely than financial ones; very measurable and precise; meaningful to the workforce so aiding continual improvement; consistent with company goals and strategies; and they change and vary over time as market needs change, and so tend to be flexible. A disadvantage, however, is that there is a huge range in terms of the number of non-financial measures that can be used by organizations. A problem arises in defining which ones to use from a huge variety of alternatives (Medori & Steeple, 2000).

It is in this context that MCDA enters the scene, having originated from operations research (OR). Operations research is a science developed to deal with decision-making, for the interest of mathematical researchers and statistical analysis for military strategy (Lyrio, Dutra, Ensslin, & Ensslin, 2007). With the success of OR, at the time, studies were then developed to adapt it to the organizational decision-making environment. With time, it was necessary to classify it into two main types of OR: Hard OR, which seeks to develop mathematical models in order to reach the optimal solution; and Soft OR, which focuses on the study of the structure of decision-making contexts, proposing to serve as an evaluation and decision support tool. (Leonardo Ensslin, Ensslin, Rocha, Marafon, & Medaglia, 2013; Leonardo Ensslin, Giffhorn, Ensslin, Petri, & Vianna, 2010; Franco & Montibeller, 2010).

Melnyk et al. (2014) highlights that a performance evaluation system consists of two components: a performance measurement system and a performance management system. The former addresses the establishment of metrics as well as the collection and interpretation of data, while the latter seeks to evaluate the differences between actual and expected results; understand the reason for the irregularities; and introduce corrective measures to improve performance.

These two systems form an "integrated system" for assessing organizational performance (Melnyk, Bititci, Platts, Tobias, & Andersen, 2014).

In this context, both the measurement and the management of organizational performance are shaped by the basic feelings, values and beliefs of the individuals and still have influence of the society in which they operate (Bititci, Garengo, Dörfler, & Nudurupati, 2012). Therefore, the organization's environment as well as the perceptions and values of the decision-maker should be considered in the development of a performance evaluation system.

The performance evaluation process must thus consider the perception of the decision-maker; remain in alignment with the organization strategies; and be dynamic, since it is necessary to consider the environmental variables and periodically revise the strategies, objectives and metrics established for the adaptation to the environment (Bititci, Turner, & Begemann, 2000; Bourne, Mills, Wilcox, Neely, & Platts, 2000).

2.2.1 Definitions for performance evaluation

According to Neely et al. (1995), performance measurement can be defined as the process of quantifying the efficiency and effectiveness of an action, while a performance measure can be defined as a metric used to quantify the efficiency and/or effectiveness of action, a performance measurement system can thus be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions (Neely, Gregory, & Platts, 1995).

Considering that the current research aims to contribute to the creation of knowledge on the possible directions to be followed in the evaluation of the SCM of a public hospital, this research leans towards the concept proposed by Ensslin et al. (2013), which is:

> […] performance evaluation is a process to develop knowledge for a decision maker that is relevant to the specific context that he or she intends to evaluate. This is conducted through activities that identify, organize, and measure ordinal and cardinal key performance factors, which allow the decision maker to understand the consequences of actions (Ensslin et al., 2013).

In this new form of performance evaluation as proposed by (Leonardo Ensslin, Giffhorn, et al., 2010), lies the recognition of the unique vision and the need to have a formal systemic view that integrates the strategic objectives into tactical and operational performance indicators and the recognition that measuring must be explicated in a scale (Leonardo Ensslin, Giffhorn, et al., 2010). This new vision makes it possible to:

a. understand the consequences of variations of performance indicators on strategic objectives and vice versa;
b. create alignment of efforts guiding what needs to be measured to control the performance of strategic objectives;
c. change the focus of measuring the performance of selected indicators according to availability and ease of measurement (quantitative and available) to identify what is important and;
d. Integrate the indicators by establishing compensations between them, basing and measuring their participation at the operational, tactical and strategic levels of the context.

2.2.2 The performance evaluation process

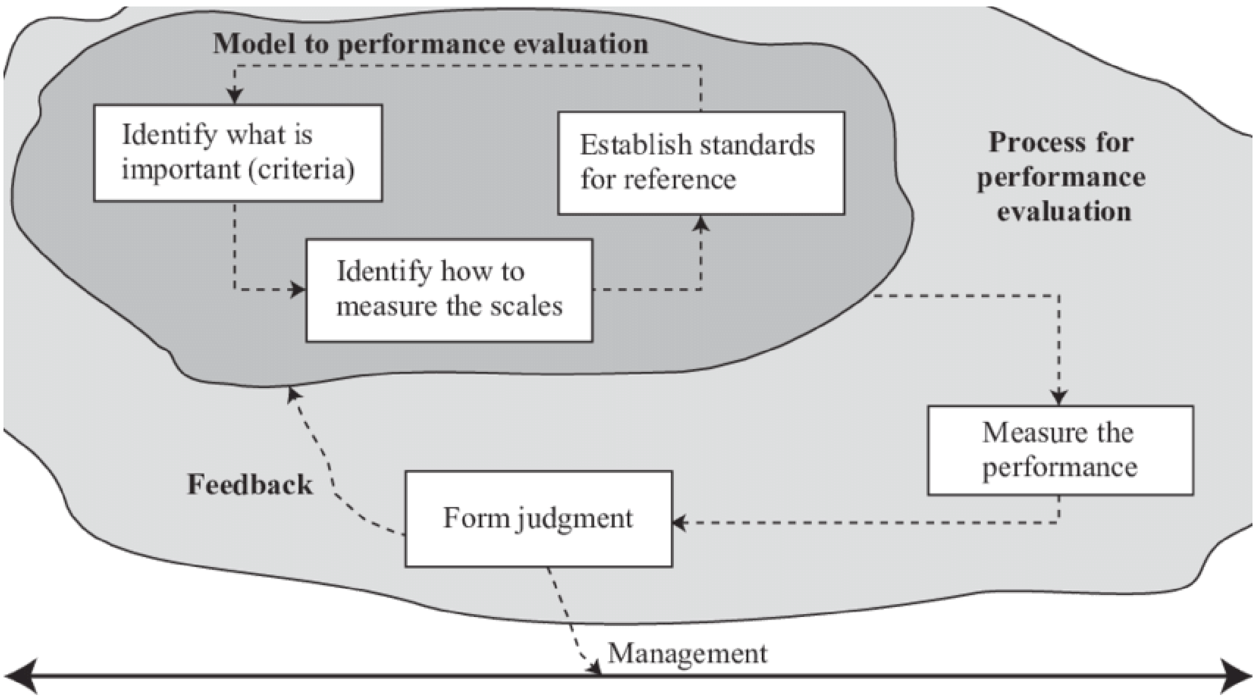
The development of performance measurement systems can be divided into three main phases, (1) the design; (2) the implementation; and (3) the use of performance measures. A simple schematic diagram of the performance evaluation process can be seen on figure 2 below.

According to Ensslin et al. (2007), the objectives of the manager, which are usually not very clear to the decision-maker himself, determine the aspects to be taken into account, when selecting the most appropriate proposal for Performance Evaluation. Thus, the performance evaluation process needs to be unique and:

a) Promote and organize knowledge of the situation;
b) Identify what is important (critical success factor);
c) Construct scales to define and measure critical factors (objective) in an unambiguous way;
d) Associate critical factors with the larger goal;
e) Know the strengths and weaknesses;
f) Subsidize the process of generating actions;
g) Facilitate and guide the process of developing more knowledge about the context;

h) Make decisions transparent, justifiable and proven best for the context.

Figure 2 - Performance evaluation process



Source: (Leonardo Ensslin, Graziano, Dutra, & Dezem, 2017)

2.2.3 Performance evaluation in the public sector

There are relentless pressures on decision-makers in public sectors to act on the quality of their services. The idea of ‘more with less’ has become a slogan, as decision-makers seek to maintain or improve the quality of service delivery.

The tradition of the public sectors in developed and developing countries has been to focus on the budget as a key instrument of public sector management. While this has some rationale, the emphasis on budget has often distorted the focus of public sector management to financial processes and timely disbursements of funds to budgeted activities. The result is often inadequate attention to the “outcomes” (and impacts) that such budgets should support.

While it is important to guarantee that public goods and services are adequately funded, the value of the budget as a public-sector management tool depends on the size of the budget used and managed. The issue is not only the budget plan and the allocation of resources, but also the efficient and effective implementation of these resources. Unfortunately, the efficiency and effectiveness of public sector management is overlooked, often with consequences. Public sectors in developing and developed countries are known for their inefficiencies, incompetence, waste, and corruption.

Thus, attention should be focused on performance management, an often-overlooked tool in public sector management. In the face of chronic inefficiencies and poor implementation of policies found in the public sectors of developing countries, the senior public-sector management is unable to effectively manage the performance of its agencies and the public sector as a whole.

Larcerda et al. (2017) alerts to the fact that the corporate world uses methods to evaluate their organizations that are not appropriate for the public sector (Behn, 2003; Fryer, Antony, & Ogden, 2009). However, one cannot rule out the use of performance evaluation within public organizations, especially when the evaluation criteria are related to the objectives of public officers and their decision-making contexts (Behn, 2003; Rogerio Lacerda, Ensslin, Krueger, & Ensslin, 2017). Thus, the need arises to find ways in which performance evaluation methods suited for the public sector can be used.

2.2.4 **Evaluation of supply chain performance**

In recent years, organizational performance measurement and metrics have received much attention from researchers and practitioners. The role of these measures and metrics in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Performance measurement and metrics have an important role to play in setting objectives, evaluating performance, and determining future courses of actions. However, performance measurement and metrics pertaining to SCM have not received adequate attention from researchers or practitioners (Gunasekaran, Patel, & McGaughey, 2004).

Furthermore, there is need to establish a more integrated Operations Management function across the supply chain, thus it becomes necessary to measure the performance of the various parts of the supply chain on various dimensions, in a consistent way. There is a need to define and measure performance for the supply chain as a whole and to be able to drill down to different measures and different levels of detail, in order to understand the causes of significant deviations of actual performance from planned performance (Lohman, Fortuin, & Wouters, 2004).

Supply Chain Performance Measures (SCPM) serve as an indicator of how well the SC system is functioning (Kazemkhanlou & Ahadi, 2014). Kazemkhanlou et al. (2014) also affirm that “performance measurement is a power tool that assists firms or organizations to evaluate resource utilization so that they can strategically manage and continuously control to achieve their objectives and goals”.

According to Elrod et al. (2013) “supply chain measurements are one key aspect of continuous improvement that has the potential to identify opportunities to cut costs, lean processes, and improve overall business functions” (Elrod, Murray, & Bande, 2013).

The main goal of SCPM models and frameworks is to support management by measuring business performance as well as analyzing and improving business operational efficiency (Kurien & Qureshi, 2011) but with the little guidance available in the literature for the actual selection and implementation of Supply Chain Performance Measurement System, the process of choosing appropriate performance measures is difficult (Kurien & Qureshi, 2011). The hundreds of performance measures available for and used by different organizations in different industries can be broadly categorized into quality, financial, time, product flexibility, overall performance, and innovation (Elrod et al., 2013).

To manage this complex and dynamic environment, Supply Chain decision makers need the aid of a process that allows them to build knowledge on the decision-making context and thus promote due improvements to achieve the expected performance of the aspects considered most relevant by the final customers. This need can be satisfied through the Performance Evaluation carried out under the constructivist view (Leonardo Ensslin, Giffhorn, et al., 2010; Leonardo Ensslin & Vianna, 2008; Giffhorn, Ensslin, Ensslin, & Vianna, 2009; J. Tasca, Ensslin, Ensslin, & Alves, 2010);

Beamon (1999) defines Performance Evaluation as the process that measures the effectiveness of systems through qualitative or quantitative metrics (Beamon, 1999). Gunasekaran et al. (2004) and Cai et al. (2009) go further and assert that Performance Evaluation involves several management processes, such as metrics identification, goal setting, planning, communication, monitoring, presentation of results and deviations from the goal, and feedback of the rationale for deviations and propose corrective actions (Cai, Liu, Xiao, & Liu, 2009; Chan, 2003; Gunasekaran et al., 2004; Staughton & Johnston, 2005). Chan (2003) and Staughton and Johnston (2005) further add that in modern business management, Performance Evaluation provides an approach to facilitate understanding of the situation and identify the potential for success of managerial strategies. In addition, Performance Evaluation is also used as a tool to implement business strategy (Johnston & Pongatichat, 2008; Kleijnen & Smits, 2003). However, few methods, shows how to identify, measure and integrate the aspects to be considered, in a specific context.

2.2.5 **Performance evaluation of supply chains in public healthcare**

Supply chain activities transform natural resources, raw materials, and components into multiple products delivered to the end customer. A highly efficient supply chain brings benefits to any organization, be it public or private. These can be in form of integrated resources, reduced logistics costs, improved logistics efficiency and high quality of the overall level of services. On the other hand, an inefficient chain will bring additional transaction costs, information management costs, and waste of resources, reducing the production capacity of everyone involved in the chain and generating problems with dissatisfied customers.

Therefore, it is necessary to evaluate the supply chain in order to make better use of resources in the face of a scarcity scenario. For this, it is important to search for various methods, performance indicator systems and technologies to evaluate, monitor, predict and optimize the supply chain performance. Najmi, Gholamian, & Makui (2013) present a literature review on various performance assessment models, showing approaches (Six-Sigma, Hierarchical, SCOR, BSC, SCOR-BSC, Process-Based, and Based on the Uncertainty Theory), techniques (Simulation, Delphi, AHP, Heuristics, DEA, and Hybrids) and criteria (cost, client, internal process, flexibility, quality, and time among others) (Najmi, Gholamian, & Makui, 2013).

According to Fan & Zhang (2016), the performance evaluation procedure of a supply chain involves using the established performance indicators, employing an analytical method, following a particular procedure, performing quantitative or qualitative comparative analysis to provide an objective and accurate assessment of a supply chain. In the literature, several researches propose systems and methods of performance indicators for the evaluation of the supply chain (Fan & Zhang, 2016).

In the work of Bhatti, Singh, & Singh (2015), a model was developed to analyze the performance of health care providers in Punjab, India using analytical modeling. The objective of this study was to develop a multidimensional quantitative performance evaluation model using the analytical hierarchy process (AHP) approach, initially developed by Saaty (1980) (Bhatti, Singh, & Singh, 2015; Saaty, 1980).

Lega, Marsilio, & Villa (2013) affirm that a solid conceptual framework for the evaluation of supply chain management in public health organizations is not found in the literature. The authors then propose a model of evaluation of the performance of the supply chain in an Italian city. The authors start from the SCOR model and add some performance indicators that are more relevant to the health sector (e.g. safety in the category of organizational benefits and prices of supplies for financial benefit) (Lega, Marsilio, & Villa, 2013).

Assessing the environmental performance of suppliers in the hospital supply chain in the United Arab Emirates, Malik et al. (2016) used the analytical hierarchical process to develop their model, transforming the qualitative assessment of a supply chain professional into a quantitative model (Malik, Abdallah, & Hussain, 2016). In addition, in hospital systems, Dotoli et al. (2015) propose a model of performance evaluation of decision-making units on uncertainties. The authors used the technique of cross-efficiency fuzzy data envelopment analysis in a case study of the Apulian health system in Italy (Dotoli, Epicoco, Falagario, & Sciancalepore, 2015).

Supeekit et al. (2016) used an Analytical Network Process (ANP) to evaluate an internal supply chain of a hospital. The process was modified by the DEMATEL multiple criteria decision analysis method. The study uses the cited model to investigate the relationship between performance groups and calculates the weights of performance aspects (Supeekit, Somboonwiwat, & Kritchanchai, 2016).

Khaldi, Chiheb, El Afia, Akaaboune, & Faizi (2017) investigate the feasibility of using the Adaptive Neurofuzzy Inference System (ANFIS) combined with DEA for performance evaluation of suppliers. Their model is aimed at modeling the performance measurement and forecasting of selected drug providers from a hospital (Khaldi, Chiheb, El Afia, Akaaboune, & Faizi, 2017).

Another model was proposed by Chorfi, Berrado, & Benabbou (2015). In their study, they developed a classification and selection model of KPIs using MCDA. The model used AHP to compare the KPIs for the criteria. The model is used to select relevant KPIs for the monitoring of the public-sector supply chain in the pharmaceutical area (Chorfi, Berrado, & Benabbou, 2015).

A simulation-based optimization model was proposed by Essoussi (2015) to evaluate the performance of some practices of the supply chain of the hospital system, focusing on pharmaceutical distribution. The author sought to evaluate the operational and economic efficiency of the logistics chain. Still in the public pharmaceutical sector, Chorfi, Benabbou, & Berrado (2016) used a two-step DEA approach to evaluate the performance of the public pharmaceutical supply chain. The model sought to build a set of aggregate metrics that best characterize the performance of the public pharmaceutical supply chain, as well as to estimate relative efficiency and compare different public supply chains for pharmaceuticals (Chorfi, Benabbou, & Berrado, 2016; Essoussi, 2015).

Chen, Preston, & Xia (2013) proposed a research model based on a relational view, delineating the factors that influence the performance of the hospital supply chain: trust, knowledge exchange, IT integration between the hospital and its suppliers and hospital-supplier integration. data from more than 100 executives, representatives of several American hospitals, public and private, urban and rural were included in this study (D. Chen, Preston, & Xia, 2013).

From data from 117 Greek public hospitals, Mitropoulos, Talias, & Mitropoulos (2015) combined stochastic DEA with Bayesian analysis to obtain statistical properties of efficiency scores. The generated model, Bayesian-CCDEA, was used to perform a sensitivity analysis to determine efficiencies under different probabilities of stochastic outputs, as well as to address the issue of DEA sensitivity for unreliable data, as in the case of a set of cross-sectional data (Mitropoulos, Talias, & Mitropoulos, 2015).

The scarcity of studies evaluating the performance of public sector supply chains calls for attention. The present study aims to contribute to the public decision-maker’s ability to have ready analytical tools for decision making in the quest for efficient and quality public service.

3 RESEARCH DESIGN

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In this sense, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data (Kothari, 2004).

In the present study, three sections comprise the overall research design. The methodological framework, the selection and literature analysis process; and finally, the construction of a performance evaluation model to assess the SCM of a public hospital.

3.1 METHODOLOGICAL FRAMEWORK

Methods are combined with each other and tailored to perform their functions as expected, leading to a specific arrangement of methods within each study. This overall arrangement is known as the as the methodological framework, and the researcher defines the methodological structure that he/she evaluates to be most suitable for his/her purposes.

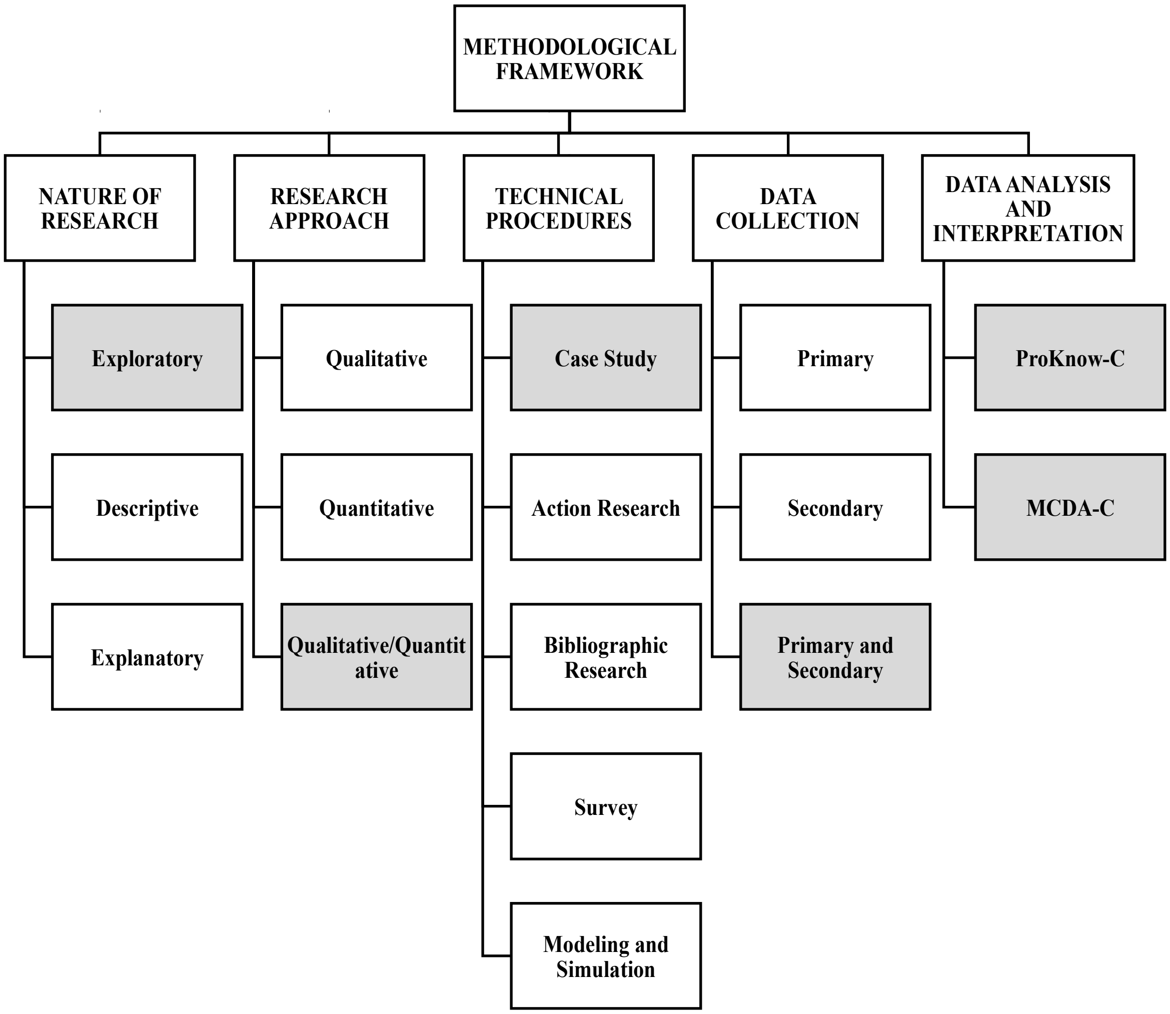
According to Richardson (1999) and Creswell & Poth (2017), there is no standard for a research methodology; therefore, the methodological framework to be adopted depends on the current the objectives pursued and the expected results. Thus, there is no single procedure to carry out the methodological framework, being necessary to adapt this procedure to the researcher's beliefs and research objectives (Creswell & Poth, 2017; Richardson, 1999).

Since it is not in the scope of this research to enter into the particularities of this question, Figure 3 only demonstrates the structure of the methodological framework adopted, with the following dimensions:

(i) Research objective;
(ii) Research process;
(iii) Research results;
(iv) Technical procedures;

(v) Intervention Instruments.

Figure 3 - Methodological framework



Source: Adapted from (Rogério Lacerda, Ensslin, & Ensslin, 2012)

In the present study, the nature of the object is classified as exploratory for promoting and expanding the knowledge of the Administrative Manager of the Dr. Miguel Riet Corrêa Jr. University Hospital (HU / FURG-EBSERH), about his area of work, based on his perceptions and values (Richardson, 1999). According to (Gil, 2008), this is characterized by a deeper understanding of the theme in question, in order to make it more explicit, based on the interaction between decision-makers and facilitators with the intention of constructing the multicriteria model.

The research process involves the approach and data collection procedures. For the approach, qualitative and quantitative characteristics are evident. Qualitative since the author examines an uncertain, complex, conflictive and singular situation in which subjectivity is present and one seeks to understand social and human activities, as pointed out by Richardson (1999), furthermore the bibliometric analysis in the context of ProKnow-C has a qualitative approach since it seeks to generate knowledge about the variables defined by the researcher. The occurrence count of the variable has the purpose of signaling to the researcher the variable he should seek information on and then validate this variable as a highlight. That is, the information on this variable is the end goal, rather than the higher occurrence count. On the other hand, the quantitative approach is present in the use mathematical operations to convert the ordinal scales into cardinal scales, during the construction of the compensation rates of the model, the determination of the global equation of the model and, finally, in the global measurement of the model.

As for data collection, both primary and secondary data are used. Primary data through the interaction between the facilitator and the decision-maker along the development of the work, and secondary data through the analysis of documents for the construction of ordinal scales and the collection of data to identify the performance profile (*status quo*) of the SCM of HU-FURG/EBSERH (Richardson, 1999).

With the aim of building a customized model to support the SCM of HU-FURG/EBSERH, case study was adopted as a technical procedure. Yin (2015, p. 32) defines case study as an empirical investigation that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomena and context are not clearly defined. Advantages of case studies include allowing a researcher to identify and measure the indicators that best represent the theoretical concepts the researcher intends to measure, and their strong procedures for fostering new hypotheses (George, Bennett, Lynn-Jones, & Miller, 2005; Yin, 2015).

For the selection of the Bibliographic Portfolio (BP) that relates to the intersection of three axes (Supply Chain Management, Performance Evaluation and the Public Sector) addressed in the present study, Knowledge Development Process-Constructivist (ProKnow-C) was operationalized. This is because it is a structured and systematic process of literature review; However, for the theoretical foundation, the selection of articles was based on scientific recognition, while for the construction of the *ad hoc* model, the Multicriteria Decision Aid-Constructivist methodology (MCDA-C) was used. This methodology was chosen because it meets the requirements for the construction of the model. Taken into account, these requirements have shown that the decision maker does not have a clear image of the problem and is also not aware of the objectives to be evaluated. The mentioned instruments for data analysis and interpretation are presented in the next section.

3.2 INTERVENTION INSTRUMENT - PROKNOW-C

Before starting a research on a certain theme, the researcher needs to know what has already been published in the scientific environment in relation to the subject of his interest (Lummus & Alber, 1997). This procedure becomes important since it will help in the definition of themes and subjects that have the potential to contribute to the scientific environment (Bortoluzzi, Ensslin, Ensslin, & Valmorbida, 2014).

However, in the scientific literature there is a great variety and quantity of publications on the topics of interest that make the search and analysis a complex and dubious activity (Cooper & Ellram, 1993). Generally, scientific literature specifies which material was used to generate such knowledge, however, the methods used to define this scientific framework are not always specified (Chaves, Ensslin, Ensslin, Petri, & Da Rosa, 2012).

ProKnow-C was developed by researchers of the *Laboratório de Metodologias Multicritério de Apoio à Decisão* (LabMCDA), of the Federal University of Santa Catarina (UFSC), to tackle this lack of a structured selection process of the scientific literature. It thus became an intervention instrument to support scientific research, being used in research by Dutra et al. (2015) among other works (S. Valmorbida & Ensslin, 2016), (Thiel et al., 2017), (L. Ensslin, Ensslin, Dutra, Nunes, & Reis, 2017), (S. Valmorbida & S. Ensslin, 2017) and (Somensi et al., 2017) among many others. A simple search for the term ProKnow-C in databases (Google

Scholar) returned more than 100 publications, only in the year 2017. Some of the latest publications using the ProKnow-C process have been compiled in the table below.

Table 1 - Latest publications using ProKnow-C in the last year

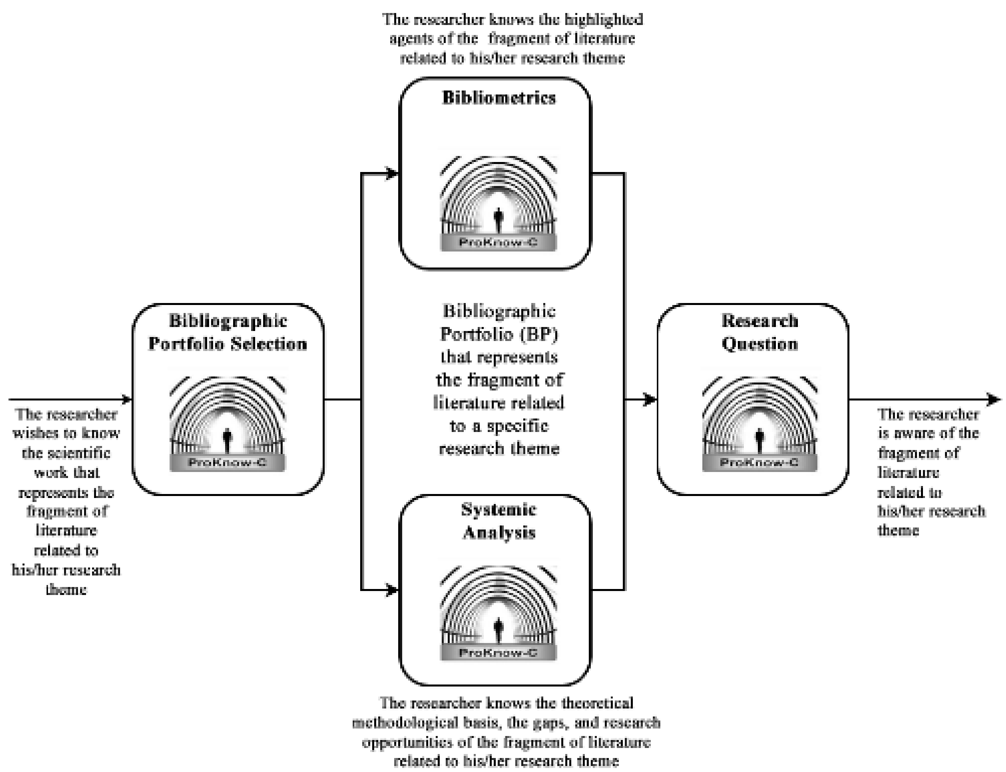
TITLE	YEAR	JOURNAL	AUTHORS
Developing criteria for performance assessment in municipal solid waste management	2018	Journal of Cleaner Production	(Rodrigues et al., 2018)
Sustainability performance evaluation of agricultural cooperatives' operations: a systemic review of the literature	2018	Environment, Development and Sustainability	(Marcis, Bortoluzzi, de Lima, & da Costa, 2018)
A Literature Review on Lean Manufacturing in Small Manufacturing Companies	2018	Progress in Lean Manufacturing	(Pereira & Tortorella, 2018)
Multidimensionality evaluation of supply chain management integration	2018	Independent Journal of Management & Production	(Arantes, Leite, Bornia, & Barbetta, 2018)
Abordagem multicritério na seleção de alternativas de tratamento de efluentes: uma revisão sistêmica da literatura.	2018	Holos Environment	(dos Santos Goffi, Bortoluzzi, Trojan, & Goffi, 2018)
Towards sustainable development through the perspective of eco-efficiency - A systematic literature review	2017	Journal of Cleaner Production	(Caiado, de Freitas Dias, Mattos, Quelhas, & Leal Filho, 2017)
Sustainability in the automotive sector: An analysis of structured content.	2017	Journal on Innovation and Sustainability	(Vaz, Lezana, & Maldonado, 2017)
Comparing Patent and Scientific Literature in Airborne Wind Energy	2017	Sustainability	(Mendonça, Vaz, Lezana, Anacleto, & Paladini, 2017)

TITLE	YEAR	JOURNAL	AUTHORS
A bibliometric analysis of the Scielo database: a Brazilian portfolio of the solidarity economy	2017	Scientometrics	(de Araújo, Rodrigues, Telles, Vaz, & Bittencourt, 2017)
Intervenções utilizando o modelo transteorético para a atividade física: estudo bibliométrico	2017	Saúde. com	(Munaro & Munaro, 2017)
Intangible asset evaluation approaches: a literature review	2017	Revista Catarinense da Ciência Contábil	(Rocha, Schnorrenberger, Gasparetto, & Lunkes, 2017)
A produção acadêmica internacional em práticas e iniciativas na gestão colaborativa em cadeias de suprimentos: um estudo bibliométrico	2017	Revista Produção Online	(Vitorino Filho, de Camargo Júnior, Pires, & Argoud, 2017)
Barriers, external aspects and trust factors in horizontal networks of companies: a theoretical proposal for the construction of a model for evaluation of trust	2017	Journal of Intelligent Manufacturing	(de Campos, Resende, & Pontes, 2017)
Avaliação de desempenho construtivista para apoiar a gestão da Universidade do Mindelo	2017	Dissertação (UFSC)	(Cardoso, 2017)
Seaport-performance tools: an analysis of the international literature	2017	Maritime Economics & Logistics	(Leonardo Ensslin, Vinicius Dezem, Ademar Dutra, Sandra Rolim Ensslin, & Karine Somensi, 2017)
Construction of Knowledge about the Theme Performance Evaluation of Communication in Public Organs: An Analysis of International Literature	2017	Revista Ibero-Americana de Estratégia	(Leonardo Ensslin, Graziano, Dutra, & Dezem, 2017)

TITLE	YEAR	JOURNAL	AUTHORS
Street lighting management and performance evaluation: Opportunities and challenges	2017	Lex Localis	(Thiel et al., 2017)
Performance evaluation of university rankings: Literature review and guidelines for future research	2017	International Journal of Business Innovation and Research	(S. M. I. Valmorbida & S. R. Ensslin, 2017)
Use of games to student training in the civil engineering undergraduation course: A bibliometric analysis	2017	European Modeling and Simulation Symposium	(Freire, Ely, Santana, Jungles, & Dalmau, 2017)
Innovativeness measures: A bibliometric review and a classification proposal	2017	International Journal of Innovation Science	(de Carvalho, Cruz, De Carvalho, Duclós, & Stankowitz, 2017)
BPM governance: a literature analysis of performance evaluation	2017	Business Process Management Journal	(L. Ensslin et al., 2017)
Voluntary disclosures on Corporate Social Responsibility (CSR): A bibliometric and systemic analysis	2017	Espacios	(Castillo-Muñoz, Ripoll, & Urquidi, 2017)
Material flow mapping and industrial ecosystems: A literature structured review	2017	Advances in Transdisciplinary Engineering	(Guedes, Paganin, & Borsato, 2017)
Ergonomic evaluation of workload by milk production – A bibliometric analysis	2017	Annals of Agricultural and Environmental Medicine	(de Oliveira et al., 2017)
Knowledge construction about port performance: Evaluation: An international literature analysis	2017	Intangible Capital	(Somensi et al., 2017)

Its nature as a systematized literature review process, makes it possible to: (i) identify a relevant fragment of literature on the topic of interest of the researcher (BP); (ii) know the peculiarities of the area under study; (iii) perform a critical analysis of this BP based on the theoretical framework selected by the researcher; and (iv) suggest gaps in the literature that subsidize the formulation of future work (Dutra, Ripoll-Feliu, Fillol, Ensslin, & Ensslin, 2015; Leonardo Ensslin, Ensslin, & Pinto, 2013) (S. M. I. Valmorbida, Ensslin, Ensslin, & Ripoll-Feliu, 2016). Figure 2 shows the four steps that comprise the operationalization process of ProKnow-C, which will be detailed below.

Figure 4 - Macro steps of the ProKnow-C Process



Source: (S. M. I. Valmorbida et al., 2016)

Table 2 - Description of the Macro Steps of the ProKnow-C Process

ProKnow-C macro step	Objective
Selection of the Bibliographic Portfolio	Identify a set of articles through structured steps: search for articles in the databases, alignment of work with the

	theme of research and selection by academic relevance of the articles.
Bibliometric Analysis	Identify characteristics that allow the cross-referencing of knowledge-building information (Valmorbida & Ensslin, 2016). This analysis can be divided into a basic and advanced analyses. The basic bibliometry (Ensslin, et al., 2017) follows textual variables, and the researcher's interpretation is not necessary, as seen in advanced bibliometry (Valmorbida & Ensslin, 2016), where the researcher's knowledge is used to identify characteristics that make the analyses feasible.
Systemic Analysis	Perform a critical content analysis of selected BP articles, based on the theoretical framework of the researcher. A structure based on six analytical lenses is used to scrutinize the research area.
Research Question	As a conclusion to the previous steps, the generated knowledge is used to elaborate the research questions from the gaps found in literature.

Source: (Thiel et al., 2017)

3.2.1 **Selection of the Bibliographic Portfolio**

The construction of the bibliographic portfolio consists of three stages (Rogério Lacerda et al., 2012): (i) Selection of the gross articles database; (ii) Filtering of the articles database; and (iii) Test of representativeness.

3.2.1.1 Selection of the gross article database

The selection stage of the gross articles database is subdivided into four phases. (i) definition of the research axes and the keywords aligned with the research theme; (ii) definition of databases; (iii) search for articles in the defined databases using the defined keywords; (iv) proof of adherence of the selected keywords, according to figure 5, and described in below:

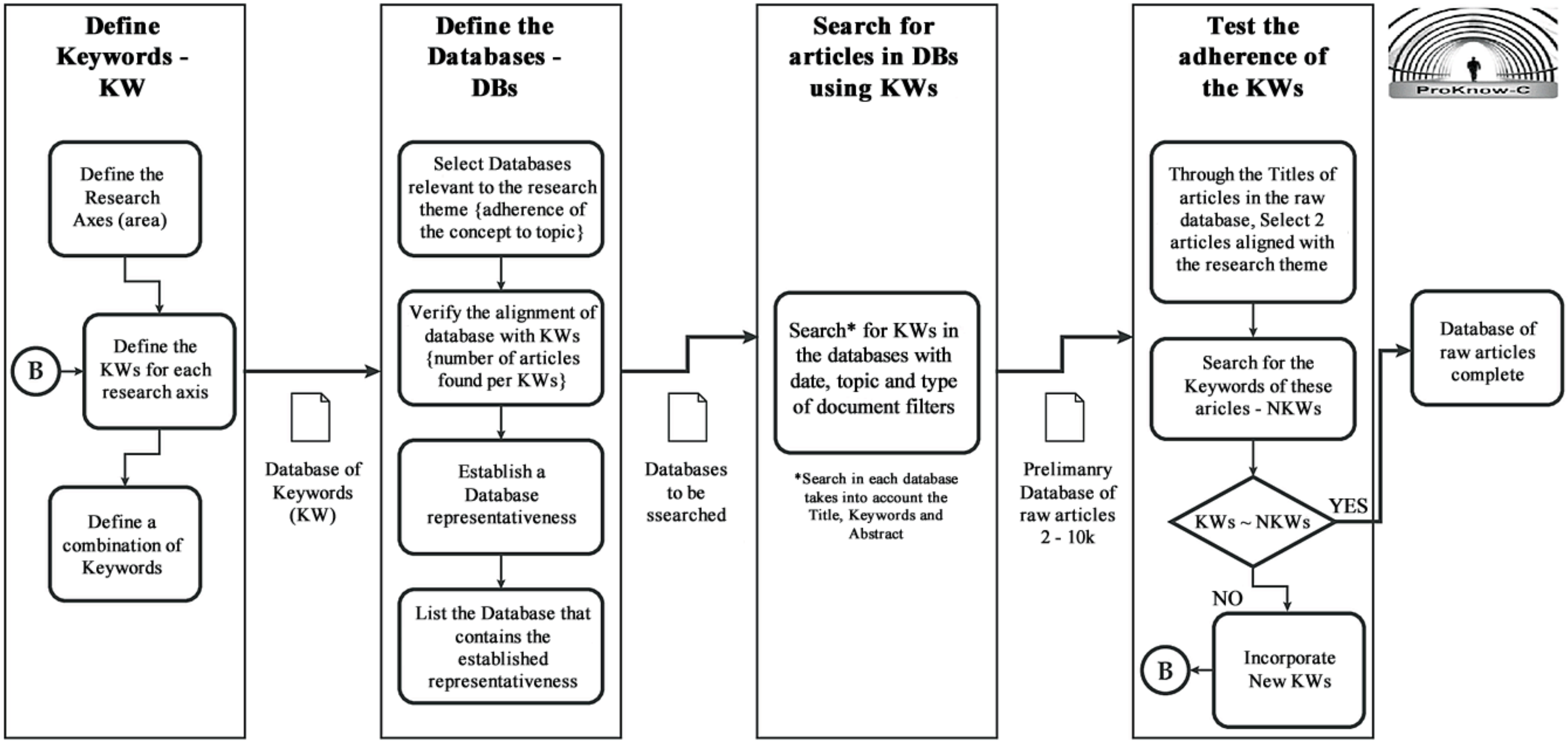
Table 3 - Description of the stages of selection of the gross articles database

Stages of the selection phase	Description

Define research axes and keywords	Define the thematic axes guiding the research; Define keywords for each axis described; Define possible combinations of keywords between the axes to search.
Define databases	Through access to the Portal of Periodicals of CAPES, select the databases that are relevant to the concept to the subject; search database alignment by searching for elaborate keyword combinations; fix the representativeness of each desired database; list the databases chosen.
Search for articles in databases	From the selection of databases, search for scientific articles with keyword combinations using limiting filters: Boolean search, year of publication, subject, file type, enable title search, keywords and summary, form the preliminary gross articles database.
Test of keyword adherence	By reading the titles of selected articles, define at least 5 articles aligned to the theme; search the keywords of these articles; check for new keywords adhering to the subject and return to the search.

Source: Adapted from (Leonardo Ensslin, Ensslin, Lacerda, & Tasca, 2010)

Figure 5 - Stages of the selection phase of the gross articles database



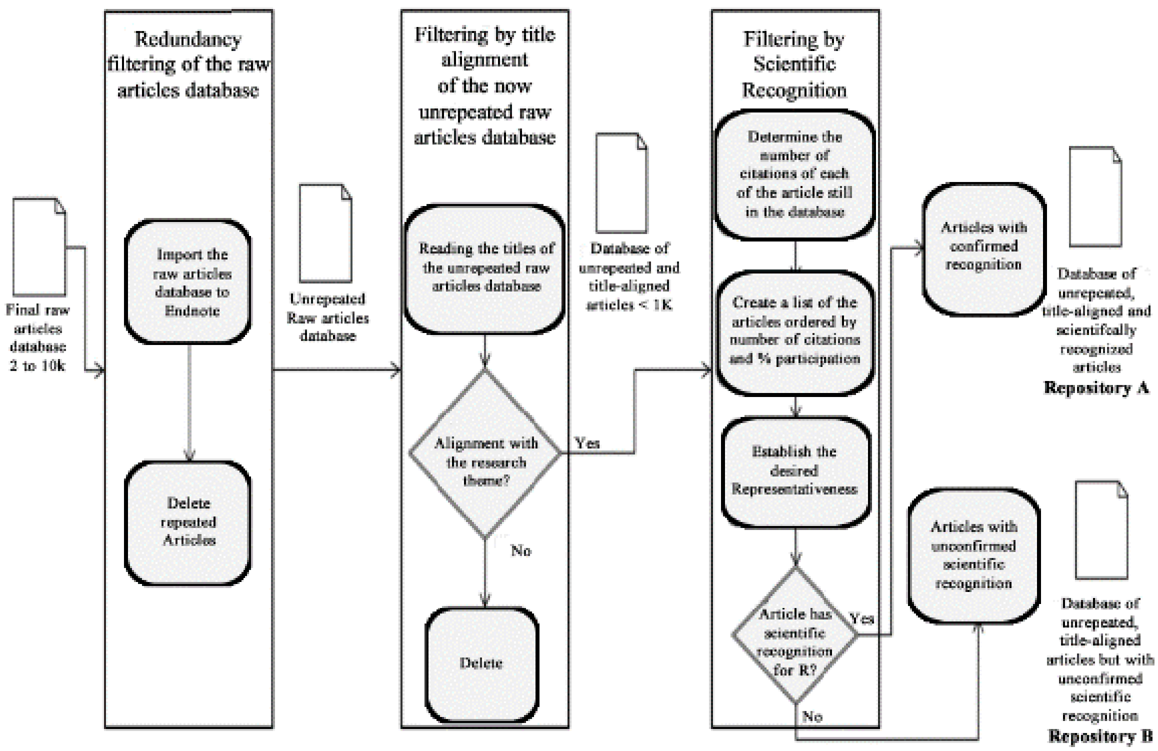
Source: (Bortoluzzi, Ensslin, & Ensslin, 2011; Da Rosa, Ensslin, Ensslin, & Lunkes, 2011), (Back, Ensslin, & Ensslin, 2012; Rogério Lacerda et al., 2012; Vegini et al., 2012)

3.2.1.2 Filtering of the gross articles database

The second step in the bibliographic portfolio selection, defined as the filtering of the gross articles database, is subdivided into five phases: (i) elimination of duplicate articles; (ii) alignment by reading the titles of the articles; (iii) alignment by scientific recognition; (iv) alignment by reading the abstract; and, (v) alignment by reading the entire article.

The structuring of the first three phases can be visualized by in the figure 5 below

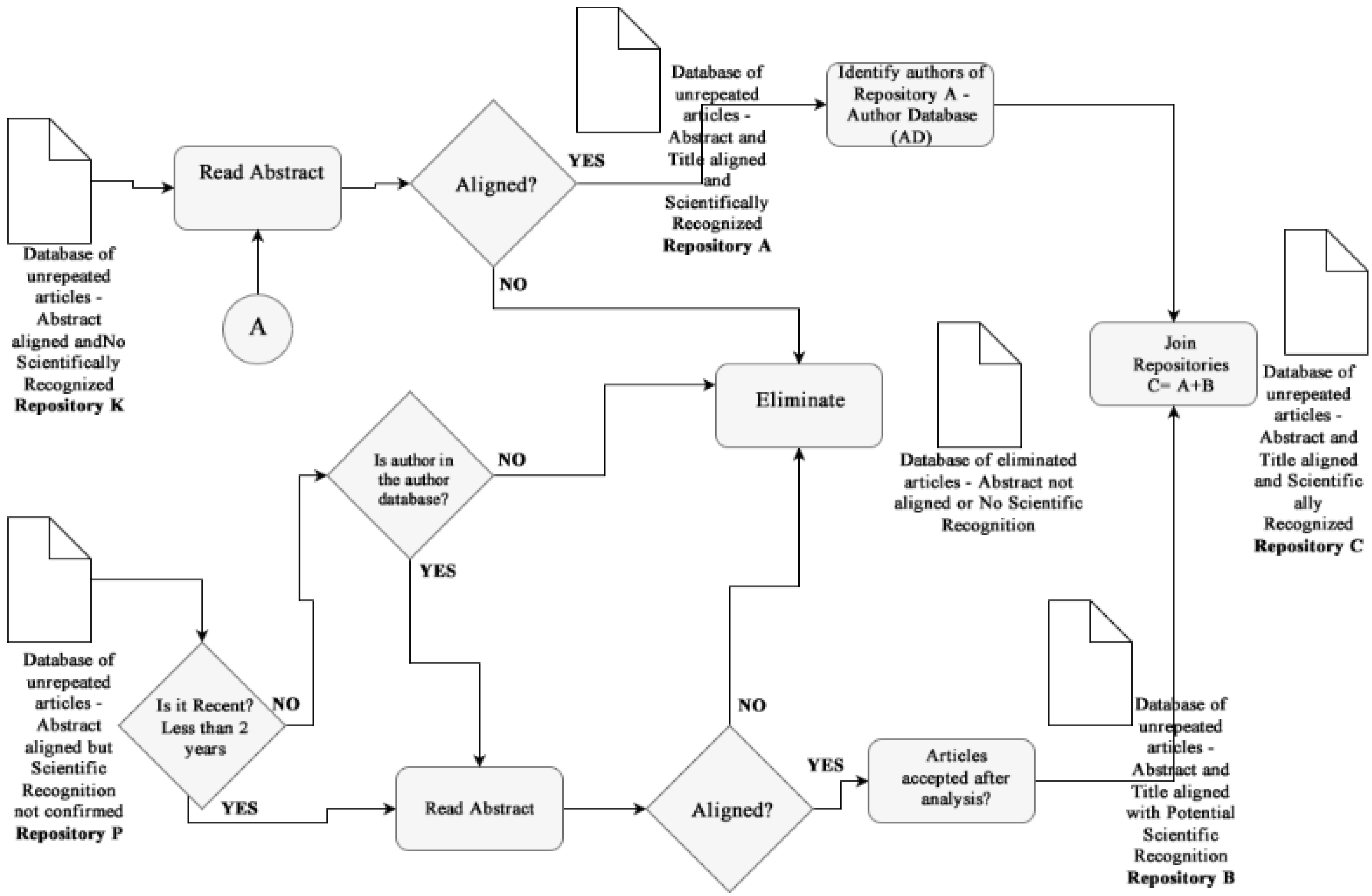
Figure 6 - Redundancy, Title and Scientific Recognition Filtering



Source: Adapted from Ensslin and Ensslin (2010)

After completing this phase, the author will have a database of non-repeated articles, title-aligned and scientifically recognized articles in function of the number of citations of each article, denominated "Repository A". The other non-repeated, title-aligned articles, but without the confirmation of scientific recognition, will make up "Repository B", for posterior tests. The next phase focuses on the alignment of the abstract, as shown in Figure 7.

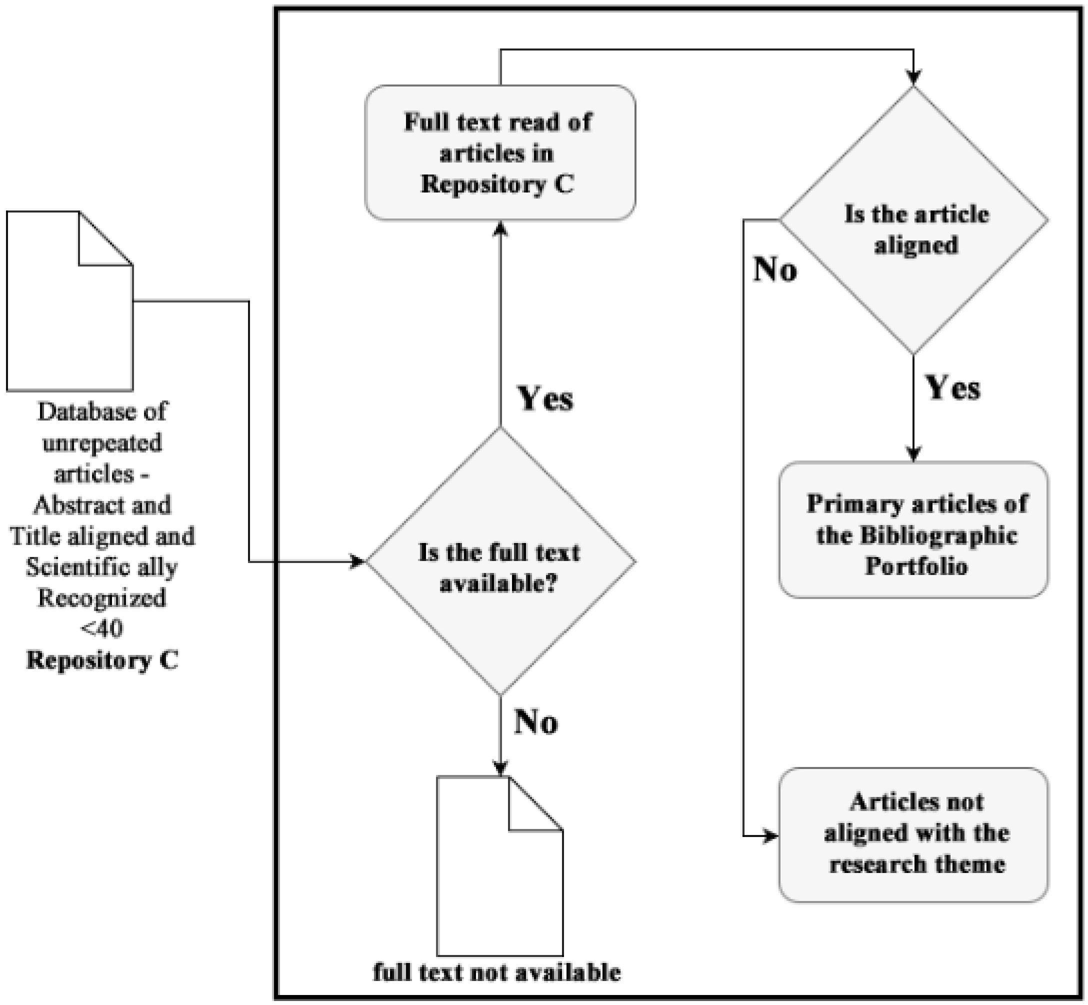
Figure 7 - Filtering for scientific recognition



Source: adapted from Ensslin and Ensslin (2010)

At this stage, the abstracts of articles in repositories K and P are read in order to confirm the alignment with the theme. When the abstract is aligned, the authors of the article are identified. It is worth noting that the reduced number of articles in the repositories led the authors to consider all articles that had abstracts aligned to the theme of study. The last phase of this step is the filtering by the alignment of the full article text, as shown in figure 8:

Figure 8 - Filtering for full text article alignment



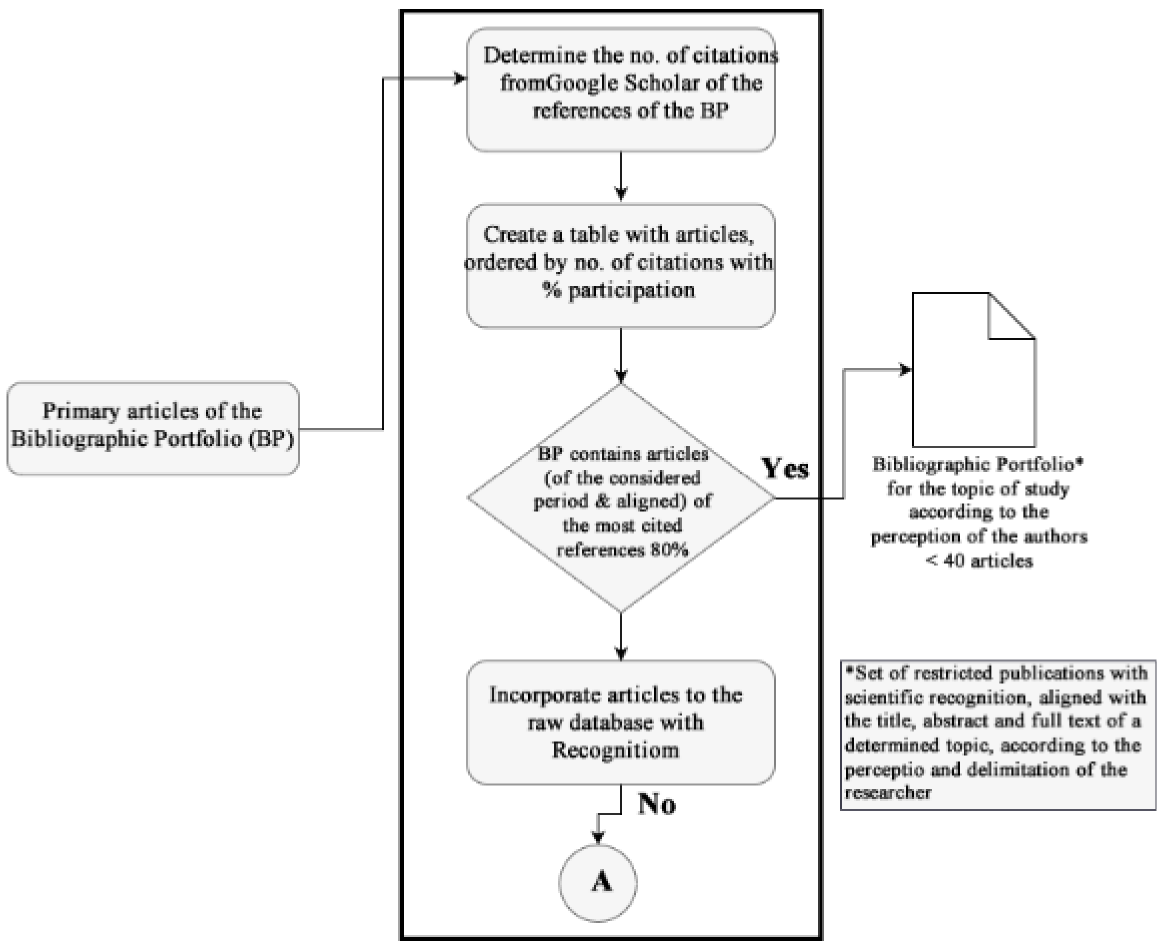
Source: Ensslin and Ensslin (2010)

3.2.1.3 Representativeness Test

The third step in the selection of the bibliographic portfolio, called Representativeness Test is responsible for retrieving relevant articles aligned with the research topic, but which, through the analysis process described previously, may have been discarded. The Representativeness Test aims to identify in the references of the bibliographic portfolio, possible scientifically recognized articles and that for some reason were not incorporated in the portfolio (Bortoluzzi, 2013).

After reading the references of the BP articles and identifying the titles aligned with the research, the researcher performs, exactly, the same steps developed in the filtering stage of the Gross Articles Bank. That is, it consists of determining the number of citations of the references articles in the bibliographic portfolio aligned to the research theme and incorporating the articles with recognition into the portfolio, as shown in figure 9.

Figure 9 - Proof of representativeness



Source: (Ensslin and Ensslin, 2010)

At the end of this stage, we have a bibliographic portfolio composed of articles considered relevant in the area of knowledge related to the research theme, aligned with the researchers' perception, according to the established delimitations for the research, as described by Matos (2014).

3.2.1.4 Bibliographic Portfolio Selection

The starting point of the knowledge construction about the theme of this research was the selection of the gross database of articles.

The first aspect to be developed in this step is to define which are the axes of the research (areas of knowledge that together explain the theme). Considering the researcher's proposal for this research "Proposal for MCDA-C in the development of a performance evaluation model of supply chain management in public hospitals", the areas of knowledge were identified as performance evaluation, supply chain management and public hospitals.

With this definition, the establishment of the keywords representative of each research axis and their combinations followed next. These keywords allowed the selection of the database of gross of articles.

For the performance evaluation axis, the following keywords were chosen:

(i) Performance Measurement;

(ii) Performance Evaluation;

(iii) Performance Assessment;

(iv) Performance Appraisal;

While for the axis related to supply chain management, the following keywords were defined:

(i) Supply chain

(ii) Logistics

(iii) SCM

(iv) Procurement

(v) Supply network

The third axis was defined by the following keywords:

(i) Public Health*

(ii) Public Hospital

(iii) Public Care

The combination of the keywords of the three research axes resulted in a set of 12 keywords with 60 total combinations, represented by the Boolean equation:

> ("Performance Measurement" OR "Performance Evaluation" OR "Performance Assessment" OR "Performance Appraisal") AND ("public health*" OR "public hospital" OR "public care") AND ("supply chain" OR "Logistics" OR "SCM" OR “Procurement” OR “Supply network”)

The next set of activities to select the gross article database lies in the definition of the databases to be searched for with the keyword combinations. Databases, as tertiary sources of information, are the tools that index and disseminate research results published in periodicals, books, theses and dissertations, technical reports, papers presented at congresses, etc. In other words, the bibliographic databases make a published research accessible to the scientific community (Johnston & Pongatichat, 2008).

In this sense, the visibility reached by publications indexed in the databases, increases the dissemination of contents registered therein and contribute to the development of a knowledge area, avoids duplication of research and promotes information exchange (Stumpf, 2001).

In Brazil, access to the largest number of databases is available to the scientific community through CAPES, in the form of its portal of periodicals on the internet (CAPES, 2018). In view of this finding, the accessible databases available through CAPES were defined as the sample space of this research.

For the selection of the searchable databases, the following criteria were used:

(i) Adherence to the theme of this work;

(ii) The search accessibility using the Boolean expression OR and AND;

(iii) Permission to search by title, abstract and keywords.

In this form, the adherent and relevant databases to the requirements were EBSCOhost, EMERALD, Engineering Village, ProQuest, Science Direct, Scopus, SpringerLink, Web of Knowledge, Wiley online library.

Following the process, the alignment of research was performed between the selected databases and the combinations of keywords defined previously, in order to determine the number of articles located through the keywords in the databases. It was thus defined that the representativeness of the databases would be 100% (one hundred percent), that is, by simply returning at least one article, the database would remain in the process. From this step, all the selected databases met the requirement with the exception of EBSCOhost that was removed from the database interface.

With the selected databases, we started to search for articles with the keyword combinations. This search had as delimitations the following criteria for selection of the articles in the databases:

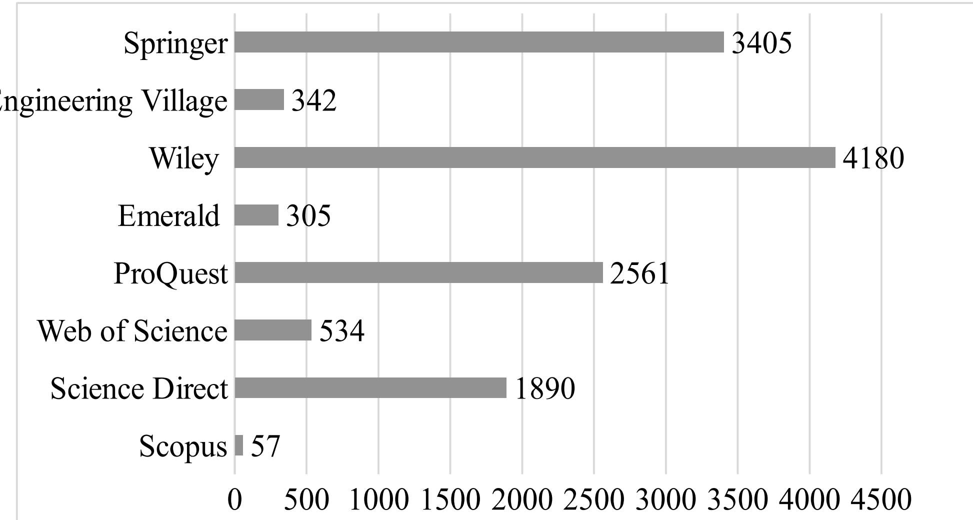
(i) Articles published in scientific journals (seeking to select works that had passed through peer review process);

(ii) Research with the keyword combinations carried out on the title, abstract and keywords of the articles in the databases where possible, since not all databases offer these search options;

(iii) Database must have an interface with EndNote.

No period limit was established, for fear of leaving out any important publication on the research topic. The database search was performed on July 15 and 16, 2018. In the 8 databases, 13274 records were located, distributed according to Chart 1.

Chart 1 - Number of publications per database



In order to ensure that the keywords used adequately represented the axis to which they were related, a keyword adherence test was performed.

By reading the titles of the selected articles, 5 sample articles with alignment to the theme of this research were selected. After the identification of the set of keywords of these articles, a comparison with the keywords used in this research was made, confirming that these were adherent to the topic under study, as shown below:

Table 4 - Keyword Adherence Test

ARTICLE 1	**ARTICLE 2**	**ARTICLE 3**	**ARTICLE 4**	**ARTICLE 5**
supply chain	*health services*	*Benchmarking*	*Performance measurement*	*Customer service management*
performance measurement	*hospitals*	*Public sector organizations,*	*quality*	*Hospitals, Laboratories*
public healthcare	*logistics*	*Performance management systems*	*Health services*	*Customer satisfaction*
Network	*multiple criteria decision analysis*	*New Zealand*	*Procurement*	*Malaysia*

3.2.1.5 Articles database filtering

The next step in the process for selecting the Bibliographic Portfolio of this research was the filtering of the article database. Initially, the 13274 records were imported into ENDNOTE reference management software. Here, duplicate publications (10315 records) were excluded. This left the database with 2959 articles.

In the next step, the titles of these articles were examined and, in cases where the title of the article was clearly misaligned with the proposed theme, the article was excluded because it would be of no contribution to this research.

This filter of the gross, non-repeated articles database, in terms of alignment by the title allowed the exclusion of 2942 articles. With this, only non-repeated articles, articles aligned by title remained in the database, this constituted a total of 17 articles. Figure 11 illustrates the results of these two activities of the filtering stage of the article database.

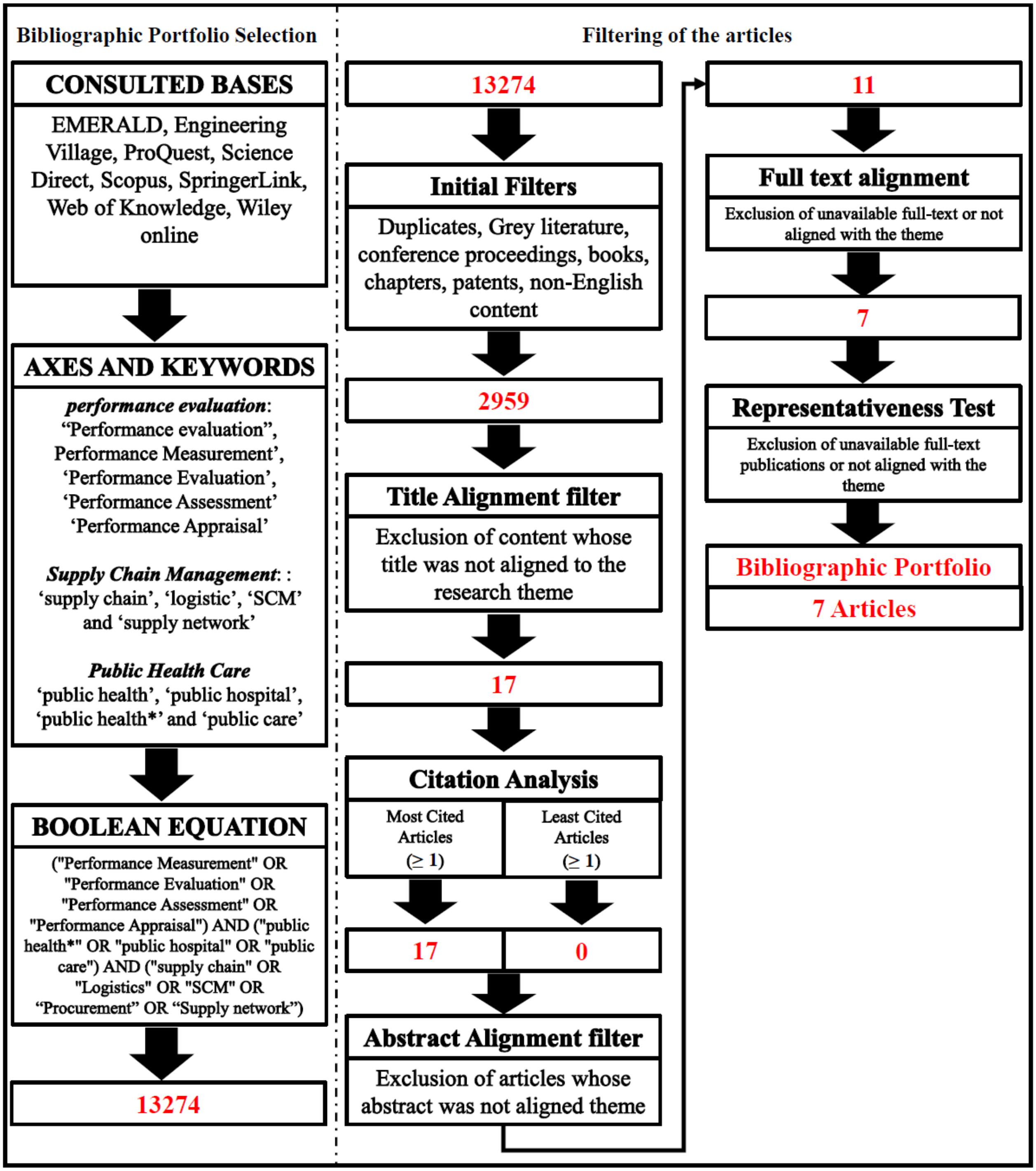
Subsequently, the filtering according to scientific recognition was carried out for the gross database of non-repeated articles aligned by title. This was measured by the number of citations of each article. Through a search in Google Scholar (GOOGLE, 2018), the number of citations of each of the 17 articles of the database of non-repeated title-aligned articles was sought and a spreadsheet containing this information was created.

The 17 articles were ordered by number of citations and by the percentage participation in the total citations of the sample. For the purposes of this study, considering the small number of articles aligned with the research topic, it was ruled that all articles that had been cited at least once would have their scientific acknowledgment confirmed. Therefore, for this research delimitation, articles with 1 citation or more were selected.

Thus, the 17 articles with confirmed recognition were integrated to the database of non-repeated, title and scientifically-aligned articles, called Repository K. After defining the cut-off point to one citation, no articles were included in Repository P. The abstracts of these 17 articles were read and 6 articles eliminated for being considered unaligned with the research topic. The remainder were included in Repository A, which now made up of non-repeated articles, aligned by title, abstract and scientific recognition.

The last set of filtering activities of the article database was carried seeking to identify articles whose content was aligned to the research theme by entirety. The first activity consisted in obtaining the full texts of the 11 articles. However, 2 of them were not fully accessible through CAPES, which is why only 9 articles were read. The reading of the full text of the remaining articles allowed the selection of 7 articles that were according to the perception of this researcher completely aligned with the research theme, and were now referred to as the primary articles of the Bibliographic Portfolio. The 2 misaligned articles were excluded from the repository. The main results of the filtering of the article database are presented below.

Figure 10 - Results from the article database filtering



Source: Adapted from (Thiel, Ensslin & Ensslin, 2017)

3.2.1.6 Representativeness test of the Bibliographic Portfolio

The Representativeness Test is done by analyzing the bibliographic references of the articles in the Bibliographic Portfolio, respecting all the initially imposed delimitations (Thiel et al., 2017). This test aims to verify if, in fact, all relevant scientific publications on the fragment of the literature in question are already incorporated. This process however did not bring any new article to the Bibliographic Portfolio. Thus, the Bibliographic Portfolio, for the theme under study according to the perception and delimitations of this researcher, remained consolidated with the seven previously identified articles

Table 5 - Bibliographic Portfolio

No.	Authors	Title	Journal	Year
1	Lega, F., Marsilio, M., & Villa, S.	An evaluation framework for measuring supply chain performance in the public healthcare sector: evidence from the Italian NHS	Production Planning & Control	2012
2	Supeekit, T., Somboonwiwat, T., & Kritchanchai, D.	DEMATEL-modified ANP to evaluate internal hospital supply chain performance	Computers & Industrial Engineering	2016
3	Hamid Abu Bakar, A., Lukman Hakim, I., Choy Chong, S., & Lin, B.	Measuring supply chain performance among public hospital laboratories	International Journal of Productivity and Performance Management	2009
4	Wynn-Williams	Performance assessment and benchmarking in the public sector: An example from New Zealand	Benchmarking: An International Journal	2005
5	Kumar, A., Ozdamar, L., & Peng Ng, C.	Procurement performance measurement system in the health care industry	International Journal of Health Care Quality Assurance	2005
6	Böhme, T., Williams, S., Childerhouse, P., Deakins, E., & Towill, D.	Squaring the circle of healthcare supplies	Journal of Health Organization and Management	2014
7	Longaray, A., Ensslin, L., Ensslin, S., Alves, G., Dutra, A., & Munhoz, P.	Using MCDA to evaluate the performance of the logistics process in public hospitals: the case of a Brazilian teaching hospital	International Transactions In Operational Research	2018

3.2.2 Procedures for the selection of material to support the use of the selected intervention instrument: Multicriteria Decision Aid- Constructivist

This section outlines the procedures used to select articles that support the use of the MCDA-C Methodology. It should be noted that the searches in the databases were carried out on December 9, 2018, and no temporal delimitation was adopted in the filters. The figure below illustrates this process.

Figure 11 - Results from the MCDA-C articles database filtering

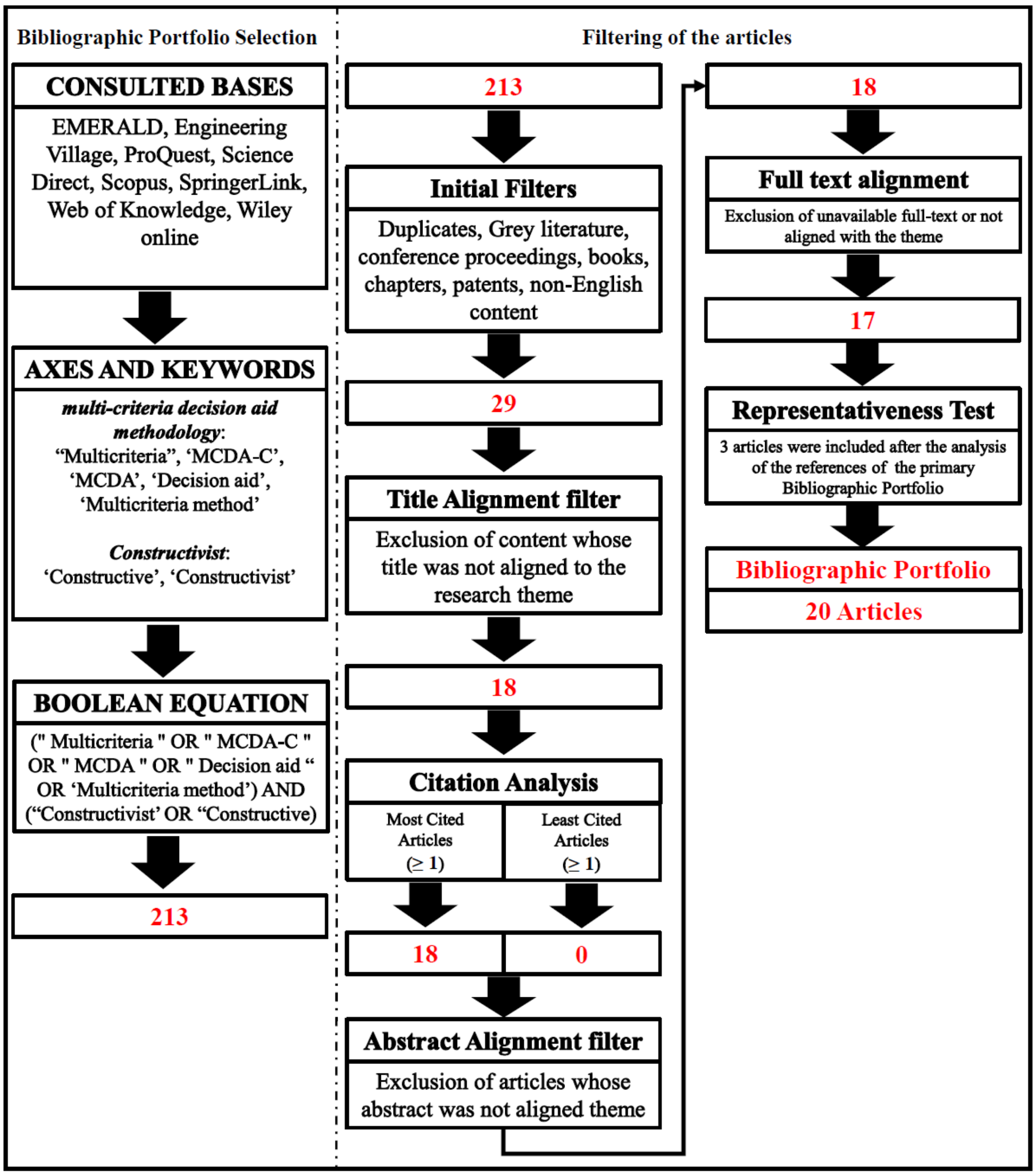


Table 6 below lists the articles that will be used to substantiate the Multicriteria Decision Support-Constructivist (MCDA-C) Methodology.

Table 6 - Articles used to substantiate the Multicriteria Decision Support-Constructivist (MCDA-C) Methodology.

No.	Authors	Title	Journal	Year
1	Longaray, A., Ensslin, L., Ensslin, S., Alves, G., Dutra, A., & Munhoz, P.	Using MCDA to evaluate the performance of the logistics process in public hospitals: the case of a Brazilian teaching hospital	International Transactions in Operational Research	2018
2	Ensslin, L., Ensslin, S., Dutra, A., Longaray, A., & Dezem, V.	Performance assessment model for bank client's services and business development process: a constructivist proposal	International Journal of Applied Decision Sciences	2018
3	Marques, S. C., Ferreira, F. A., Meidutė-Kavaliauskienė, I., & Banaitis, A.	Classifying urban residential areas based on their exposure to crime: A constructivist approach	Sustainable cities and society	2018
4	Rodrigues, A. P., Fernandes, M. L., Rodrigues, M. F. F., Bortoluzzi, S. C., da Costa, S. G., & de Lima, E. P.	Developing criteria for performance assessment in municipal solid waste management	Journal of Cleaner Production	2018
5	Bortoluzzi, S. C., Ensslin, S. R., Ensslin, L., & de Almeida, M. O.	Multicriteria decision aid tool for the operational management of an industry: a constructivist case	Brazilian Journal of Operations & Production Management	2017
6	Ensslin, L., Dezem, V., Dutra, A., Ensslin, S. R., & Somensi, K.	Management support for agricultural enterprises: a case study for a fruit-producing company.	International Food and Agribusiness Management Review	2017
7	A. D. Marafon, L. Ensslin, R. T. de Oliveira Lacerda & S. R. Ensslin	The effectiveness of multi-criteria decision aid methodology: A case study of R&D management	European Journal of Innovation Management	2015
8	Alves, V. T., Mairesse-Siluk, J. C., Neuenfeldt-Júnior, A. L., Soliman, M., & Dalla-Nora, L. D.	Performance assessment of internal logistics for service companies	Revista Facultad de Ingeniería Universidad de Antioquia	2015
9	E. Della Bruna, Jr., L. Ensslin e S. Rolim Ensslin	An MCDA-C application to evaluate supply chain performance	International Journal of Physical Distribution and Logistics Management	2014
10	R. T. d. O. Lacerda, L. Ensslin, S. R. Ensslin e A.	A Constructivist Approach to Manage Business Process as a	Knowledge and Process	2014

	Dutra	Dynamic Capability	Management	
11	R. C. de Azevedo, R. T. D. Lacerda, L. Ensslin, A. E. Jungles & S. R. Ensslin	Performance Measurement to Aid Decision Making in the Budgeting Process for Apartment-Building Construction: Case Study Using MCDA-C	Journal of Construction Engineering and Management-Asce	2013
12	R. T. de Oliveira Lacerda, L. Ensslin & S. R. Ensslin	A performance measurement framework in portfolio management: A constructivist case	Management Decision	2013
13	S. R. Ensslin, L. Ensslin, F. Back e R. T. D. O. Lacerda	Improved decision aiding in human resource management: A case using constructivist multi-criteria decision aiding	International Journal of Productivity and Performance Management	2013
14	L. Ensslin, L. C. M. Scheid, S. R. Ensslin R. T. de Oliveira Lacerda	Software process assessment and improvement using Multicriteria Decision Aiding - Constructivist	JISTEM-Journal of Information Systems and Technology Management	2012
15	F. S. da Rosa, S. R. Ensslin, L. Ensslin & R. J. Lunkes	Environmental disclosure management: a constructivist case	Management Decision	2012
16	R. T. de Oliveira Lacerda, L. Ensslin & S. R. Ensslin	A performance measurement view of IT project management	International Journal of Productivity and Performance Management	2011
17	L. de Moraes, R. Garcia, L. Ensslin, M. J. da Conceição, S. M. de Carvalho	The multicriteria analysis for construction of benchmarkers to support the Clinical Engineering in the Healthcare Technology Management	European Journal of Operational Research	2009
18	L. Ensslin, A. Dutra e S. R. Ensslin	MCDA: a constructivist approach to the management of human resources at a governmental agency	International Transactions in Operational Research	2000
19	Bana e Costa, C. A., Ensslin, L., Cornêa, É. C., & Vansnick, J. C.	Decision support systems in action: integrated application in a multicriteria decision aid process	European Journal of Operational Research	1999
20	B. Roy	Decision science or decision-aid science?	European Journal of Operational Research	1993

Source: Research data

3.3 DATA COLLECTION AND ANALYSIS PROCEDURES

3.3.1 Bibliometric and Systemic Analyses

Having selected the BP of the fragment of literature referent to Performance Evaluation of public HCSCM, the second and third stages of ProKnow-C, namely Bibliometric Analysis and Systemic Analysis, are put into practice. Bibliometric Analysis aims to generate knowledge to the researchers about the characteristics that involve the publications contained in the resulting articles contained in the BP, as well as to know how and what path to adopt to find information pertinent to the theme (Dutra, Ripoll-Feliu, Fillol, et al., 2015; S. Valmorbida & S. Ensslin, 2017).

Bibliometric Analysis is divided in analysis of basic and advanced variables (Somensi et al., 2017; Thiel et al., 2017). The basic variables to be identified in this study are: (i) the most prolific author (s) in this area of knowledge; (ii) the journals with the most publications on the topic; (iii) the most commonly used performance evaluation methodology/tool in the articles; (iv) countries where the model/study developed. The advanced analysis addresses: (i) the areas where the performance measures in practical studies were built, whether operational, strategic or financial; (ii) the indicators presented in the literature; (iii) the presence of components of a performance evaluation system; (iv) PE systems used (status quo/final evaluation, measurement, or management) (Melnyk et al., 2014); (v) Pathway (s) of the Performance Evaluation in which the empirical studies on Performance Evaluation of Supply Chains have been affiliated (operational, operational to strategic, strategic to dynamic, dynamic to dynamic to stakeholders) (Suwit et al., 2011; Dutra, Ripoll-Feliu, Fillol, et al., 2015); and (vi) Epistemological approach adopted in the articles (discrete, discrete to integrated, or integrated)(Bititci et al., 2012); (vii) areas of supply chain management that performance evaluation has been applied and the main criteria analyzed; (viii) Characteristics of the decision-making process, such as number of people involved,; and (ix) techniques employed to develop the Performance measurement models.

After completing Bibliometric Analysis, the next stage of ProKnow-C consists of Systemic Analysis, defined as the scientific process used to analyze a sample of representative articles of a particular research subject, based on a world view, defined and explained by its lenses, aiming at showing, for each Lens, and globally, for the established perspective, the highlights and the knowledge opportunities found in the sample (J. Tasca et al., 2010; Thiel et al., 2017; S. Valmorbida & Ensslin, 2016). Therefore, this analysis allows the identification of deficiencies in the studies, which will enable the survey of new research opportunities in the area (Somensi et al., 2017).

For the Systemic Analysis, the theoretical affiliation assumed by the researchers of the present study is based on the understanding of Performance Evaluation formulated by Ensslin et al. (2007, p. 5), where Performance Evaluation (1) is the process to build knowledge in the decision maker (2), regarding a specific context (2) that one proposes to evaluate, from the perception of the decision maker through activities that identify (3), organize, measure (4) ordinally and cardinally and integrate (5) and allow visualizing (6) the impact of actions and their management (6) (Somensi et al., 2017).

As can be seen, this definition is divided into six lenses, which are presented below.

Table 7 - Six Lenses for Systemic Analysis

Lens	What is sought?
Approach	Does the approach used in the article in analysis harmonize the constructed model (approach and data) with its application?
Singularity	Is the problem recognized as unique (actors and physical context)?
Goal Identification	Is there a process to identify goals according to the decision maker's perception?
Measurement	Are the properties of measurement scales recognized (Descriptive, Nominal, Range, Ratio)?
Integration	Is the fact that integration requires reference levels recognized?
Management	Does the knowledge generated make it possible to know the current profile, its monitoring and improvement?

Source: (Ensslin et al. 2007, p. 5).

3.3.2 *Instrument of Intervention: Multicriteria Decision Aid - Constructivist (MCDA-C) Methodology*

The intervention instrument adopted to construct the model is the Multicriteria Decision Aid-Constructivist methodology (MCDA-C). This methodology is characterized as an evolution of traditional MCDA. The constructivist-based approach of MCDA-C methodology allows the decision maker to generate knowledge about their decision-making context and ensure their active participation in all stages of the methodology. The decision maker then identifies his/her consequences and impacts of future decisions, which are based on their values and preferences(Leonardo Ensslin et al., 2000; Leonardo Ensslin, Dutra, Ensslin, Krüger, & Gavazini, 2017; S. Ensslin et al., 2013; A. Longaray et al., 2018; J. E. Tasca, Ensslin, & Ensslin, 2012).

MCDA-C finds its most remote origins more than two centuries ago (R. T. Lacerda, Ensslin, & Ensslin, 2009). However, its consolidation as a scientific management tool only occurred from the 1980s, with the works of Roy (1993), Roy and Vanderpooten (1996) and Landry (1995) in defining the limits of objectivity for decision aid processes (Landry, 1995; Roy, 1993; Roy & Vanderpooten, 1996).

MCDA-C emerges as a branch of the traditional MCDA, which emerged from Operational Research (OR), a science developed during World War II by mathematical and statistical researchers, with the purpose of making decisions for military strategies (S. R. Ensslin, Ensslin, Lacerda, & dos Santos Matos, 2013; Lyrio et al., 2007), to support decision-makers in complex, conflicting and uncertain contexts. Complex because they involve multiple qualitative and quantitative variables, partially or not explicitly. Conflicts involving multiple actors with interests not necessarily aligned and/or with concerns distinct from the decision maker who does not have an interest in confronting them, even acknowledging that they will be disputing the scarce resources. They are uncertain because they require the knowledge of qualitative and quantitative information that decision-makers recognize not knowing what they are, but who wish to develop this knowledge in order to make conscious, informed decisions according to their values and preferences (Zimmermann, 2000).

This concept led to the emergence of MCDA-C, which eventually dissociated itself from the traditional MCDA, precisely by the adoption of the constructivist paradigm in opposition to the rationalist paradigm that was in force until then (Leonardo Ensslin, Giffhorn, et al., 2010; Leonardo Ensslin et al., 2001).

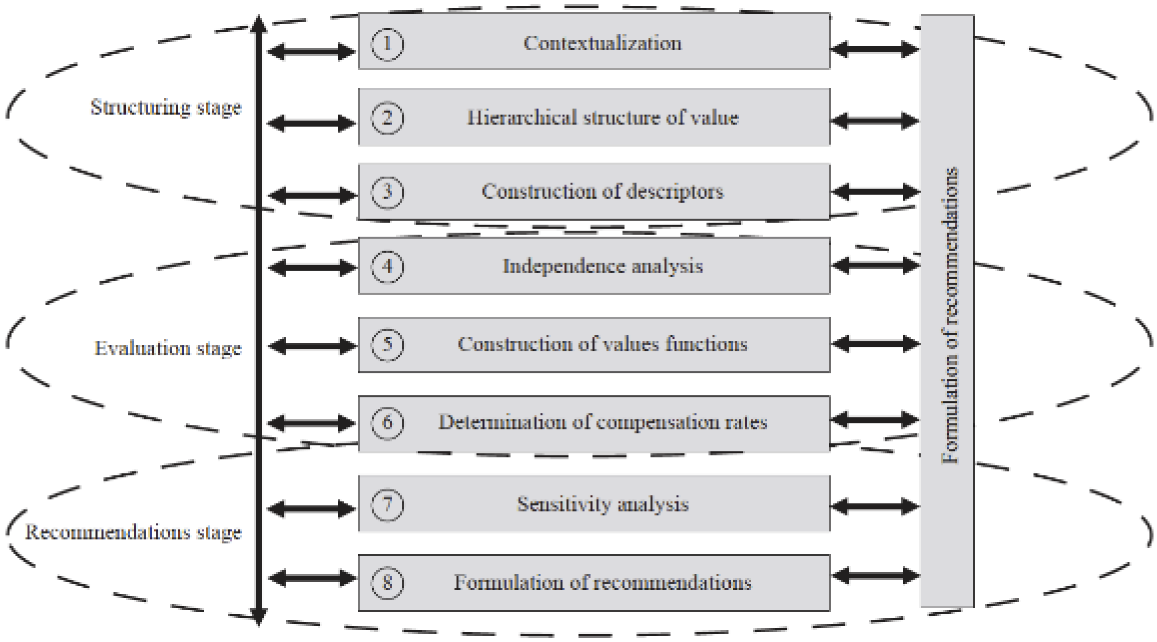
Drawing on the concept of constructivism, as proposed by Roy (1993), this study is based on the recognition that a decision maker must expand his or her understanding of the consequences of their decisions regarding the aspects that they deem to be important and, through constructed knowledge, evaluate these aspects and recommend improvements without imposing on the rationalism of objectivity (de Moraes, Garcia, Ensslin, da Conceição, & de Carvalho, 2010; Leonardo Ensslin, Giffhorn, et al., 2010; Rogério Tadeu de Oliveira Lacerda, Ensslin, & Ensslin, 2011; Roy, 1994).

Furthermore, in the constructivist paradigm, the decision is conceived, not as a moment, a presupposition of “decision making”, but rather as a process that is often long, conflicting, chaotic and uncertain (Leonardo Ensslin, Giffhorn, et al., 2010). That is to say, the decision cannot be separated from the decision-making process and from the actors involved, because it is in the decision-maker that the necessary knowledge in a specific context is built on the consequences of the alternatives on their values and preferences, not on the values and preferences themselves. Thus, the decision-maker will select the most appropriate path to his or her needs and interests, contemplating the interaction with the environment and the people in it. Therefore, according to the constructivist paradigm, there is no “optimal solution” (Leonardo Ensslin et al., 2001; Keeney, 1996).

The main advantages of using MCDA-C are the possibility of addressing qualitative and quantitative information, the possibility of explicitly capturing and presenting the objectives and values of decision-makers, the possibility of allowing decision-makers to reflect on their objectives, priorities and preferences, and the possibility of developing a set of conditions and means to inform the decisions according to what the decision-maker considers most appropriate (Zamcopé, Ensslin, Ensslin, & Dutra, 2010) (Rogério Tadeu de Oliveira Lacerda et al., 2011).

MCDA-C is operationalized in a systemic and systematic way through three sequential and interactive stages: structuring, evaluation and recommendation (Carlos A Bana e Costa, 1993; Leonardo Ensslin et al., 2017; Rogerio Tadeu de Oliveira Lacerda, Ensslin, Ensslin, & Dutra, 2014; A. A. Longaray, Ensslin, Ensslin, & da Rosa, 2015), as shown in Figure 9.

Figure 12 - MCDA-C methodology



Source: (Ensslin et al., 2017)

3.3.2.1 Structuring phase

The structuring phase of the MCDA-C methodology allows the identification, organization and ordinal measurement of the concerns that the decision-maker deems necessary and sufficient to assess the context (Leonardo Ensslin, Giffhorn, et al., 2010). Thus, this phase seeks the understanding of the problem and the context in which it is inserted and enables the generation of knowledge within the decision-maker (Cardoso, Ensslin, & Dias, 2016; S. R. Ensslin, de Carvalho, Gallon, & Ensslin, 2008).

This is the most important phase of MCDA-C, because it is concerned with ensuring that the decision aid model to be built is legitimate, i.e. there is a adherence between the model and the decision-maker's problem (R. C. Azevedo et al., 2011; R. C. d. Azevedo et al., 2013; Chaves, Ensslin, Ensslin, Valmorbida, & Shinohara, 2013; Leonardo Ensslin et al., 2000) (L. Ensslin, S. R. Ensslin, et al., 2013; Marafon, Ensslin, Lacerda, & Ensslin, 2015) (S. Ensslin et al., 2013; A. A. Longaray & Ensslin, 2014).

The activities developed in the structuring phase in pursuit of this goal can be divided into three steps:

I. Contextualization;

II. Hierarchical structure of value; and

III. Construction of descriptors

3.3.2.1.1 *Contextualization*

To begin the structuring of the model, problem contextualization is carried out, identifying in the context, the general objectives associated, activities and challenges involved, resources, inputs and outputs and connections to the external environment. The facilitator will then identify the decision-maker, the actors (people involved in the decision-making process) with power to interfere in the decision-making process, and the actors who suffer the consequences of the decisions taken (Bortoluzzi, Ensslin, & Ensslin, 2010); (R. C. d. Azevedo et al., 2013; Leonardo Ensslin, Dutra, Ensslin, Longaray, & Dezem, 2016).

After identifying the actors involved in the decision-making context, a label that characterizes the main concerns about the problem should defined. The main objective of this definition is to delimit focus and to keep the attention in the relevant aspects associated with the problem. Then, a problem summary should be created, taking into account the following items:

- ◊ Presentation of the problem;
- ◊ Justify the importance of the problem;
- ◊ Define the goal to be achieved;
- ◊ Describe the proposal to achieve the goal and remedy the problem;
- ◊ Describe the expected results.

After the validation of these stage by the decision maker, the contextualization stage is completed (Leonardo Ensslin et al., 2001).

3.3.2.1.2 *Hierarchical structure of value*

The hierarchical value structure step is intended to collect data on the value system, that is, to construct the values perceived by the decision maker as necessary and sufficient to evaluate the context. This stage is initiated by the construction of a meeting agenda (open and semi-structured interviews) with the decision maker, where he is encouraged to freely discuss the decision-making context, thus allowing the identification of aspects such as: concerns, actions potential, positive and negative consequences of these actions, goals, objectives, restrictions, among others (R. C. d. Azevedo et al., 2013).

The interpretation of the information obtained in these interviews, carried out in an interactive and recurring manner, with the help of the decision maker, leads to the:

- ◊ Identification of the Primary Evaluation Elements (PEEs), which are the characteristics or properties of the context that the decision maker believes impact his/her values;
- ◊ Transformation of PEEs into action-oriented concepts by identifying a verb that best associates the PEE with an action that leads to the goal portrayed by the element. Each concept should establish the desired direction of preference (the present pole) and the negative consequences (the opposite psychological pole), that the decision maker wishes to eliminate or minimize regarding a given PEE. The poles are separated by "..." (Ellipsis) that should be read as "is preferable to" or "instead of"

It is common to identify redundant concepts in this phase of the process, and this fact does not characterize error or lack of understanding of the context (Leonardo Ensslin et al., 2011).

With a greater understanding of the context obtained by the construction of the concepts, the next activity is to identify the strategic objectives associated with the knowledge obtained so far. Thus, from the reading of the concepts, the decision-maker, supported by the facilitator, identifies the most strategic objectives (areas of concern) and organizes them in a hierarchical structure.

Next, the decision-maker, again with the support of the facilitator, should link each concept to an area of concern (strategic objective), each area having at least one associated concept. This allows to test if the objectives meet the properties of necessity and sufficiency when compared to established concepts. This activity allows to bring together the first concepts that explain the values of the decision maker and the properties of the context that the same takes into account when evaluating this area (Leonardo Ensslin et al., 2000).

With this activity tested and validated by the decision maker the hierarchical structure of value is obtained and ending this step of the structuring phase.

3.3.2.1.3 *Construction of descriptors*

The objective of the construction of descriptors is to develop the ordinal scales that will allow the measurement of the performance of the properties of the context in which the strategic objectives are operationalized (Leonardo Ensslin et al., 2001) and begins by identifying hierarchical relations and relations of influence between concepts.

This activity is supported by the construction of means-ends relationship maps, elaborated by the facilitator, by requesting the decision-maker to discuss for each concept, “how the concept end can be obtained?” and “Why is the concept means is important?” (Leonardo Ensslin, Giffhorn, et al., 2010). This allows the identification of causal links with other concepts, identifying the lines of argumentation that lead from the means concepts to the strategic concepts.

To facilitate analysis and understanding, the map of means-ends relations is divided into smaller maps, forming clusters. The clusters are formed by grouping the lines of argumentation that reflect the same concern of the decision maker and do not have relations of influence with other clusters (Leonardo Ensslin, Giffhorn, et al., 2010).

One concern to be considered is that the initial clusters must be tested to represent aspects of the context in order to be essential, controllable, complete, measurable, operational, isolatable, non-redundant, concise, and understandable (Leonardo Ensslin, Giffhorn, et al., 2010; Leonardo Ensslin et al., 2001; Keeney, 1996). This causes many initial clusters to be further dismantled until they reach the properties above. Once these properties have been met, the clusters are then migrated to a tree structure, receiving the denomination of Fundamental Points of View (FPVs) (Leonardo Ensslin, Giffhorn, et al., 2010).

However, FPVs are still too comprehensive to be associated with ordinal scales. Thus, the subclusters present in the maps of means-ends relations are analyzed. The subclusters must obey the same properties of the initial clusters. Once this goal is reached, the subclusters are transported to the same tree structure and these subcriteria are called Elementary Points of View (EPVs). This process of decomposition continues until a PVE that represents a property of the context is obtained and thus can be measured in an objective and unambiguous way (Leonardo Ensslin, Giffhorn, et al., 2010).

The resulting tree structure is called Hierarchical Structure Value (HSV), where each element of the lower level will serve as the basis for the construction of the descriptors (ordinal scales of measurement) and the areas that describe them are composed of the family of FPVs of the context (Rogério Lacerda et al., 2012).

The ordinal scales (descriptors) are constructed in an interactive process with the decision maker, by associating their abstract values with one or more object properties, and the order of preference of the possible performances established by the decision maker.

The MCDA-C methodology accomplishes this association through the maps of means-ends relations (cognitive maps). The abstract values of the decision maker appear in the cognitive map as the concepts ends (top of the map), their operationalization occurs by the lines of argumentation that lead to the means concepts. The maps allow for the expansion of decision-maker's knowledge, because they allow the cause-and-effect relationship between the operational and strategic objectives to be visualized (Bortoluzzi et al., 2011; Cardoso et al., 2016). It is important to emphasize that all the concepts present in the line of argumentation must be taken into account when constructing the descriptor, instead of measuring only the most operational concepts (Leonardo Ensslin et al., 2011).

Once the scale that best represents what the decision maker deems relevant is constructed, the decision maker should identify the upper and lower reference levels, representing respectively the level above which performance is considered excellent and the level below which performance is considered compromising. Between the two levels, the performance is considered competitive or normal.

The decision maker also identifies the performance of the current situation (*status quo*) at each of the constructed scales (descriptors).

After the legitimation by the decision-maker on the detailing of the hierarchical structure of value and the descriptors that operate it, one reaches the maximum of qualitative knowledge that can be constructed, ending the structuring phase.

For a further expansion of knowledge, one must add information that allows the transition from the qualitative model to a quantitative model, something which occurs in the next phase of the MCDA-C methodology, the evaluation phase.

3.3.2.2 Evaluation phase

At the end of the structuring phase, the MCDA-C methodology will have completed the construction of a performance evaluation model containing all the aspects judged by the decision-maker as necessary and sufficient to evaluate the context at hand. However, the scales used in this model are ordinal scales, called descriptors, and often use numerical symbols for their representation. These symbols actually represent alphanumeric symbols and not a set of real numbers ($\Re$), and it can be misleading to use these symbols for any function that uses numerical operations (Barzilai, 2001)

The MCDA-C methodology proposes the expansion of the understanding of the context, adding quantitative instruments, from the theory of measurement, allowing the decision maker to understand the difference of attractiveness between the levels of a scale, i.e., transforming the ordinal scales used into cardinal scales, and thus enabling the integration of the scales (A. Longaray et al., 2018). However, as a caution, it should be emphasized that for the integration of scales to be possible, the criteria involved must be independent.

Thus, the MCDA-C methodology brings the following stages in its evaluation phase (Leonardo Ensslin, Giffhorn, et al., 2010):

- ◊ Analysis of independence;
- ◊ Construction of value functions;
- ◊ Identification of compensation rates; and
- ◊ Overall (global) assessment and impact profile of the current situation.

3.3.2.2.1 *Analysis of Independence*

Independence or isolation (preferential independence) is achieved when the current performance of a descriptor, regardless of the descriptor, has no influence on the attractiveness of the performance levels of other descriptors belonging to the same point of view (Keeney, 1996). In other words, the independence of a point of view is achieved when there are no cause and effect relationships between the descriptors that compose it.

Thus, the independence analysis consists of testing for the existence of cause and effect relations between all the descriptors, according to the Mutual Preferential Independence proposed by Keeney (1996).

3.3.2.2.2 *Construction of the Value Functions*

The construction of the value function is the element by which the decision maker explains the difference in attractiveness between the levels of the scale of a descriptor.

This activity can be performed by several methods: Direct Score, Bisection, MACBETH, among others (Leonardo Ensslin et al., 2001). MCDA-C uses these methods to transform the ordinal scales into cardinal scales. The MACBETH method, due to its theoretical basis, representativeness and practical recognition, has been the most used (Leonardo Ensslin, Giffhorn, et al., 2010).

The use of the MACBETH method to transform ordinal scales into cardinal scales is started by asking the decision maker to express the difference in attractiveness between two potential alternatives *a* and *b* (*a* more attractive than *b*) based on an ordinal scale of seven semantic categories (null, very weak, weak, moderate, strong, very strong and extreme) proposed *a priori* to the decision maker for each interval of the descriptor (Carlos A Bana e Costa & Vansnick, 1995).

In the next step, the Upper (100) and Lower (0) anchor levels are established, transforming the scale into an anchored interval scale. Thus, the upper and lower anchor levels will have the same degree of attractiveness for all descriptors and equal numerical scores for all value functions (A. Longaray et al., 2018).

Based on the decision-maker's responses, the matrix of judgments is constructed, whose values serve as inputs for M-Macbeth software (Carlos A. Bana e Costa, De Corte, & Vansnick, 2017) to determine the value function, which enables the cardinal measurement of the descriptors. With the construction of the value functions, the MCDA-C methodology will provide the decision maker with an understanding that enables the cardinal measurement of each operational aspect considered relevant. However, the strategic aspects, the fundamental points of view (FPVs) and the intermediate elementary points of view (EPVs) cannot yet be measured, since they are the result of the integration of the current performance of descriptors.

3.3.2.2.3 *Identification of Compensation Rates*

For the integration of the descriptors and consequent measurement of the FPVs and EPVs, it is necessary to determine in what proportion each descriptor contributes to the performance of its superior objective. This is determined by the calculation of the compensation or contribution rates.

The recommended method is the MACBETH Pairwise comparison, since it does not require the decision-maker to express value judgments numerically, but rather semantically (A. Longaray et al., 2018).

It is important to note that the compensation rates are directly related to the reference levels indicated when constructing each descriptor (Keeney, 1996).

In order for the decision maker to express his value judgments about the hierarchical structure that one wishes to integrate and that will allow the determination of the compensation rates, it is necessary to create alternatives that represent the transition from the lower level to the higher level in each of the criteria involved, as well as an alternative with inferior performance in all the covered criteria.

These alternatives are ordered and introduced to the M-Macbeth software, which, using the same logic described in the previous subsection, provides the compensation rates. The same process is performed for all hierarchical structures, determining the compensation rates for all FPVs and EPVs.

3.3.2.2.4 Global Assessment and Impact Profile of the Current Situation

The global impact assessment of an action is determined using the additive aggregation function (Leonardo Ensslin, Giffhorn, et al., 2010):

$$V(a) = \sum_{i=1}^{n_K} W_{i,k} \times V_{i,k}(a)$$

Where:

$V(a)$ is the value of the global score of action a;

$W_{i,k}$ is the compensation rate of criterion i, $i = 1, ..., n$, in FPV_k, for $k = 1, 2, ..., n$;

$V_{ik}(a)$ is the partial value of action a in the criteria i, $i = 1, ... n$, of FPVk, for $k = 1, ..., n$;

a is the performance achieved in the criterion with action a;

n_k: number of FPV_k criteria, for $k = 1, 2, ..., n$;

n: number of FPVs of the global model.

From this point on, it is possible to determine the global assessment of the current situation and possible potential actions.

MCDA-C methodology models allow making explicit the evaluation of the current situation and/or potential alternatives numerically and/or graphically, facilitating the identification of the strengths and weaknesses of the context (current situation) (Rogério Tadeu de Oliveira Lacerda et al., 2011).

With the comprehension of where it is appropriate to act (weaknesses) and the strategic advantages (strengths), the decision maker can identify potential actions and assess their impact on the achievement of their objectives. This occurs in the Recommendations phase (R. C. d. Azevedo et al., 2013).

3.3.2.3 Recommendations

For the MCDA-C methodology, the Recommendations step is intended to aid the decision maker in identifying the best ways to leverage performance against the context under evaluation, as well as to understand the consequences of these actions on their strategic objectives, if they are to be implemented. In some cases, it may be necessary to analyze the extent to which the performance of the alternatives change due to the modification of the compensation rate of the FPV or EPV in analysis (R. C. d. Azevedo et al., 2013), a procedure denominated as Sensitivity Analysis.

3.3.2.3.1 Sensitivity Analysis

In order to provide an overview of the performance stability of the alternatives, the model allows the development of sensitivity analysis on the impact of the alternatives on the scales, on the attractiveness difference of the cardinal scales, as well as on the compensation rates. In some cases, in this procedure, it may be necessary to determine the extent to which the performance of the alternatives is changed, due to changes in the compensation rates of the FPVs or EPVs in analysis.

3.3.2.3.2 Formulation of Recommendations

As previously mentioned, the formulation of recommendations, in the MCDA-C methodology, serves as support to the decision maker, to help him or her identify ways to improve the performance of the object being evaluated, as well as understand the consequences of these actions on the strategic goals of the decision maker if they are to be implemented. Thus, this step does not have a prescriptive character to inform the decision maker on what to do, but rather a support character to help build actions and understand their consequences (Leonardo Ensslin, Giffhorn, et al., 2010). These actions are specific for each case and are established following the analysis of the performance profiles. This analysis identifies the criteria that the decision maker is expected to meet to improve performance, (Leonardo Ensslin et al., 2017). The recommendations derived during the final stage as well as those that originate during the process are a result of the learning generated due to participation in the construction of the model (Roy, 1993).

The Recommendation stage in the MCDA-C methodology therefore provides the means for the decision maker to identify (Leonardo Ensslin, Giffhorn, et al., 2010):

- ◊ Where it is convenient to act;
- ◊ The process to generate actions to promote improvement;
- ◊ The Visualization of the consequences of deployment at the local level (descriptor) or operational (EPV), tactical (in the FPV) and strategic (Global) levels.hytyty

The MCDA-C methodology is therefore an appropriate tool for situations where decision makers want to improve their understanding of the current configuration, to act purposefully and negotiate reliably and transparently with the stakeholders involved (Rogério Tadeu de Oliveira Lacerda et al., 2011).

4 BIBLIOMETRIC AND SYSTEMIC ANALYSES RESULTS

This section is divided in two: (i) Bibliometric Analysis and (ii) the Systemic Analysis;

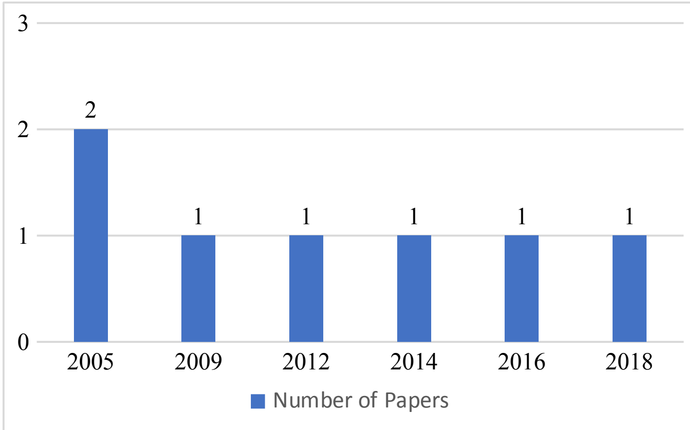
4.1 BIBLIOMETRIC ANALYSIS

The analyses herein result from the characteristics of the articles that compose the selected bibliographic portfolio and their respective references. The results are directly related to the prior choices of the researchers, carried out through a rigorous inclusion and exclusion criteria.

The limited number of studies found did not come as a surprise due to the specificity of the research topic. This has been reported previously in literature. Examining the literature concerning empty or limited-articles reviews, for example, Yaffe et al. (2012) state that empty reviews may relate to an area of study which is very new, reviews may focus on questions that are highly specific or that reviews may be the result of overly stringent methodological inclusion criteria imposed in the interest of higher quality evidence (Yaffe, Montgomery, Hopewell, & Shepard, 2012).

A brief descriptive analysis of the portfolio shows that the oldest study was published in 2005 while the most recent was published in 2018, and that though mainstream SCM literature has increased along the years, the public sector has not seen similar progress. The number of studies on the public-sector front of SCM seems to be limited. In addition to the bibliographic portfolio, three conference proceeding studies that did not meet the inclusion criteria are highlighted, Khaldi et al. (Khaldi et al., 2017), Chorfi et al. (Chorfi et al., 2016; Chorfi et al., 2015) and Essoussi et al. (Essoussi, 2015), have published studies on the present research topic.

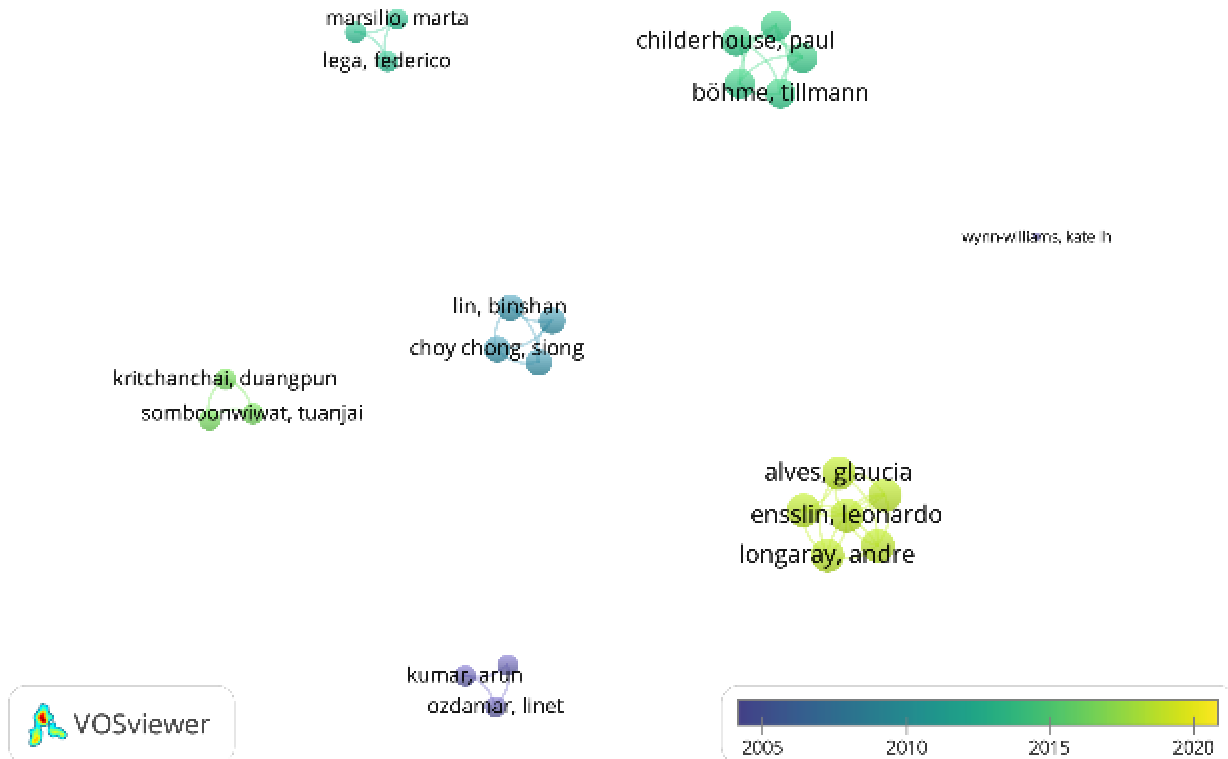
Figure 13 - Distribution of papers by year



Based on information crossing between authors and references of the BP, (Lega et al., 2013) are Italian researchers on health care management. The authors of (Supeekit et al., 2016) are all Industrial engineers working on research in the area of hospital logistics and supply chain. They are all from Thailand. (Wynn-Williams, 2005) is a specialist in benchmarking, having publications in public-sector health systems in New Zealand. The authors of (Bakar, Hakim, Chong, & Lin, 2009) are management experts from Malaysia with research in diverse management areas. (Kumar, Ozdamar, & Peng Ng, 2005) was authored by Production engineers from Singapore, with a research focus on Logistics and supply chain management. The authors of (Böhme, Williams, Childerhouse, Deakins, & Towill, 2014) have several publications on healthcare supply chains, their area of research is logistics and operations management and their focus is on Australasian healthcare supply chains. (A. Longaray et al., 2018) was written by authors who have a vast experience in performance evaluation and the MCDA-C methodology, their research was the closest aligned with the present research.

The authors also investigated possible links between authors of the BP, through creation of a co-authorship network using VOSviewer (van Eck & Waltman, 2010). The tool uses a visualization method based on the distance between the nodes of the analyzed network, so that the distance between two nodes indicates approximately the intensity of the relation between them, with such a relation being greater, the smaller the distance (Van Eck & Waltman, 2014). No connection was found between the authors of each BP article. According to the authors, through the analysis of co-authoring networks it is possible to identify how researchers, research institutions or countries relate according to the amount of studies they carry out and publish jointly.

Figure 14 - Co-authorship network constructed using full counting.

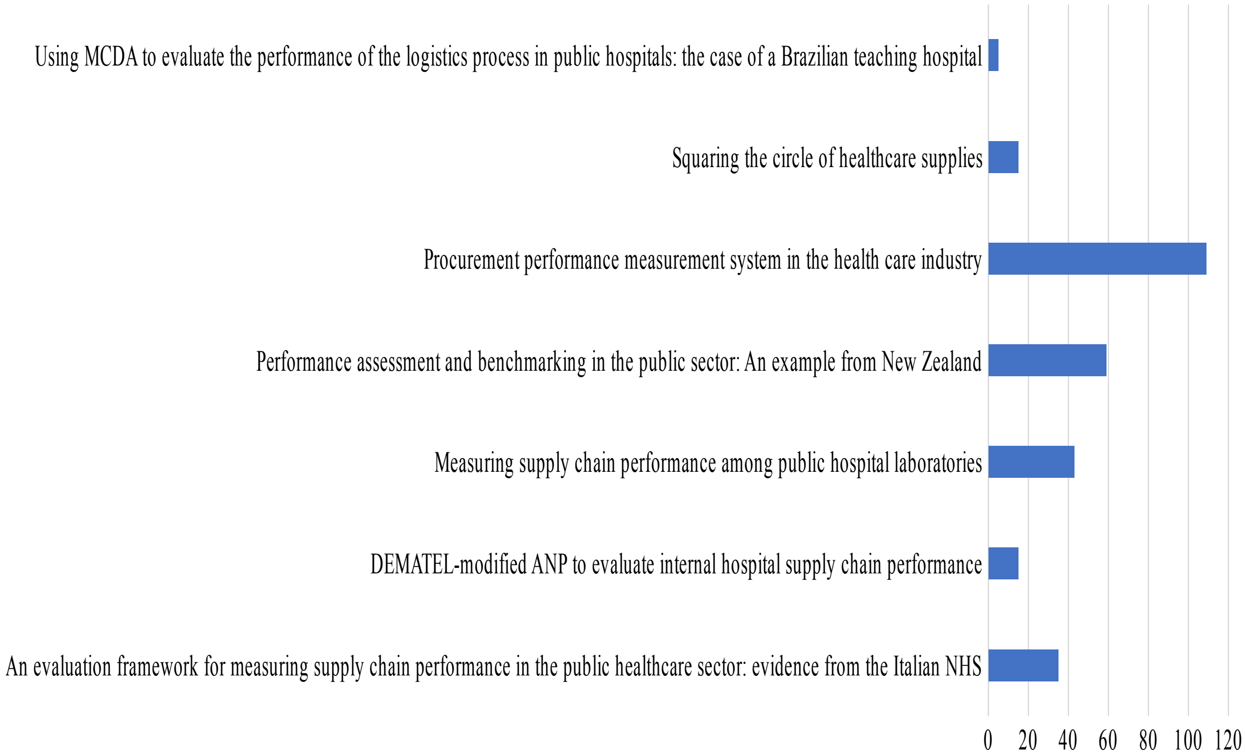


The research topic is covered in a great variety of journals. However, we point out that this prominence is part due to the greater areas of Supply Chain Management and part by Performance evaluation, which are more consolidated in extant literature. The distribution of the studies and references are shown below.

Figure 15 - Distribution of the portfolio and references by publication

The Number of citations of a research is considered as an indicator of its interest to the scientific community. Prominence herein was represented by the number of times each article is mentioned in Google Scholar (see below). The Figure shows that the article with the highest number of citations reached 109.

Figure 16 - Number of citations of the portfolio articles

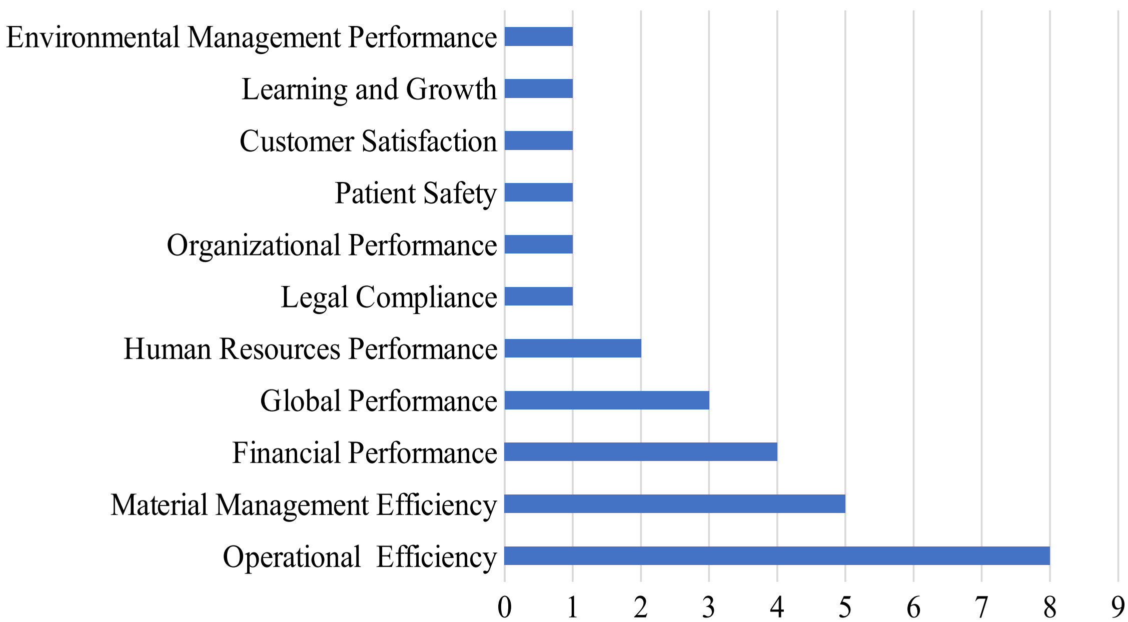


The final step of the Bibliometric Analysis of the Portfolio articles consisted of nine variables: (i) the areas where the performance measures in practical studies were built, whether operational, strategic or financial; (ii) the indicators presented in the literature; (iii) the presence of components of a performance evaluation system; (iv) PE systems used (status quo/final evaluation, measurement, or management) (Melnyk et al., 2014); (v) Pathway (s) of the Performance Evaluation in which the empirical studies on Performance Evaluation of Supply Chains have been affiliated (operational, operational to strategic, strategic to dynamic, dynamic to dynamic to stakeholders)(Suwit et al., 2011; Dutra, Ripoll-Feliu, Fillol, et al., 2015); and (vi) Epistemological approach adopted in the articles (discrete, discrete to integrated, or integrated) (Bititci et al., 2012); (vii) areas of supply chain management that performance evaluation has been applied and the main criteria analyzed; (viii) Characteristics of the decision-making process, such as number of people involved,; and (ix) techniques employed to develop the Performance measurement models.

Several methodologies are used to evaluate the performance of operations in literature. The analysis of the methodologies presented in the portfolio articles show that each opted for a different method to evaluate performance. Only two articles refer to specific performance evaluation models built in a personalized way by the researchers, and other two count on literature analysis to present a theoretical model as can be seen in table 8 below.

The organizational performance can be evaluated in several ways, in a macro organizational context and/or in a micro organizational context involving an area, an activity or a project. The authors sought to identify the focus of the performance evaluation followed by the authors of the portfolio of this research; this is summarized in the figure below.

Figure 17 - Focus of the Performance evaluation indicators



From the figure above, we can note that the focus of most research has been directed to operations and materials with financial performance coming in closely. Further, it is observed that the authors focused on a specific SC area, as illustrated below. We observe that the areas addressed in the BP were hospital laboratories, material management, the hospital network, internal logistics, and inpatient wards. Böhme et al. (2014) analyzed uncertainty in the entire supply chain. To get into more detail, the authors identified specific criteria used in the indicators shown above. These are presented below.

A deeper analysis into the area of the supply chain under study shows that only Longaray et al. (A. Longaray et al., 2018) is concerned with the management aspect of a component of the supply chain, i.e. logistics. The rest focus on the measurement aspect, ignoring the management, whose premise is to analyze, identify and signal the differences between actual and desired results and introduce improvement actions. This analysis points out research opportunities for studies that investigate and explore SCM, from the perspective of Performance Evaluation.

Considering the performance evaluation tools, the authors highlight Operations Research, Modelling, heuristics and simulation techniques to look at the portfolio articles. 3 articles of the PB construct a model, and 2 make use of tools for the construction. The tools used are shown in Table 7 below. With the exception of Longaray et al. (2018), the frameworks constructed in the BP articles herein do not give room to the management of performance and only dwell on performance measurement. Having a Performance Measurement System simply is not good enough, since it means that one just has a set of measures which let you know whether you are on track to achieve your strategy and accomplish your objectives. Organizations need to have a process of evaluating, responding to, and aligning around those measures in order to get anything out of them. While performance measurement asks, “How do we track the progress of the strategy we have put in place?” performance management asks, “How do we manage the strategy we have put in place?”

The management process requires that the leadership team meet on a regular basis and discuss the results. The team should then discuss the actions they are going to take to improve the results and determine where your projects link into those results. Therefore, while measures may tell you where you are today, the actions you are going to take to improve those results for the rest of the year are more important. Leadership teams should be able to say, “we are behind in this performance measure; who is responsible for this particular measure? Accountability for initiatives is important, and getting the team aligned around the results will drive the organization forward. Cardoso (2017) draws attention to the importance of measuring and managing organizational performance in a complementary way, as the well-known axiom says, “If you cannot measure it, you cannot manage it” (Asif & Searcy, 2014).

The analysis of the decision-making contexts draws attention to the fact that all the portfolio articles address decision-making at the strategic level, and Longaray et al. (2018) and Supeekit et al. (2016) make use of individual based decision making. Group decision making is presented in the remainder of the articles as shown in the Table below. This indicates research opportunities to consider the various stakeholders whose actions are involved in the building of a PE model, decision-makers such as material suppliers, service providers and public-sector managers themselves.

The epistemological approach of the articles showed that only one article presents a final note for the composition of the indicators (global assessment). The epistemological approach has opportunities for the application of the Integrated PE Systems, considered as a trend in the Performance Evaluation models (Bititci et al., 2012).

Table 8 - Summary of advanced variables analyzed in the portfolio articles

Study	***Area of supply chain management***	***Decision-making level***	***Group or individual based decision-making?***	***Criteria evaluated***	***Operations Research (OR), Heuristic, and Modelling techniques employed***
Bakar et al. (2009)	hospital laboratories	Strategic	Group	Performance measurement inputs and outputs are obtained from questionnaires, importance/performance analysis, doctor satisfaction dimensions and hospital laboratory input	Statistical applications: Data envelopment analysis (DEA) and Importance-Performance Matrix
Böhme et al. (2014)	Entire Supply chain	Strategic	Group	Uncertainty	A four-level prism model
Kumar et al. (2005)	Material management	Strategic	Group	A set of generic measures, and six perspectives resources, procedures and output: (1) customer; (2) supplier; (3) process;(4) IT system; (5) learning and growth; and (6) overall.	Multicriteria methods: balanced scorecard
Lega et al. (2012)	hospital network	Strategic	Group	Operational cost (Warehouse management Costs, Human resources, Costs of outsourced Services, Administrative tendering costs) Financial benefits (Prices trend, Efficiency in managing supplies), Organizational Benefits (Products standardization, Process standardization, Staff specialization, Quality service levels, Supplier relationship management)	Theoretical
Longaray et al. (2018)	Internal logistics	Strategic	Individual	Requests, Standardization, availability, control, accuracy, management practices, humanization, satisfaction, purchases, consumption, demand, computerized cotrol systems, planning, and costs.	Multicriteria model: MCDA
Supeekit et al. (2016)	Inpatient ward	Strategic	Individual	Patient safety (Free from error, No delay in treatment, Completeness of treatment), clinical care process efficiency (Clinical care process cost, Clinical care process time, Clinical care process reliability, Clinical care process productivity), and supporting process efficiency (Supporting care process cost, Supporting care process time, Supporting care process reliability, Supporting care process productivity)	Multicriteria methods: DEMATEL-modified ANP
Wynn-Williams (2005)	Pharmaceutical Management Agency	Strategic	Group	Cost savings, critical organizational processes	Theoretical

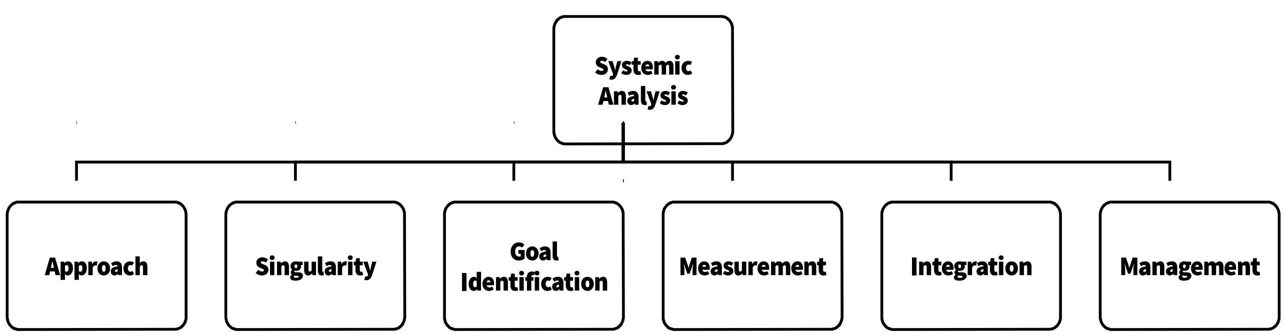
4.2 SYSTEMIC ANALYSIS

A scientific process used for a world view (theoretical affiliation) defined and made explicit by its lenses, to analyze a sample of articles representative of a given research subject, aiming to show for each lens and globally, for the established perspective, the highlights and the opportunities (lack) of knowledge found in the sample(Leonardo Ensslin, Giffhorn, et al., 2010; J. Tasca et al., 2010).

The world view (theoretical affiliation) assumed for the systemic analysis within the framework the present study is based on the understanding of performance measurement as a decision support instrument, thus conceptualized by Ensslin et al., (2013). The authors define Performance Evaluation as a process to build knowledge in the decision maker, regarding the specific context that one proposes to evaluate, from the perception of the decision maker himself through activities that identify, organize, measure, ordinally and cardinally, integrate and allow him to visualize the impact of his actions, and management."

Moreover, it was from this world view of performance evaluation that the six lenses used for systemic analysis were generated based on the theoretical affiliation of PE adopted by the authors (Figure 18).

Figure 18 - The Six Systemic Analysis Lenses of Performance evaluation

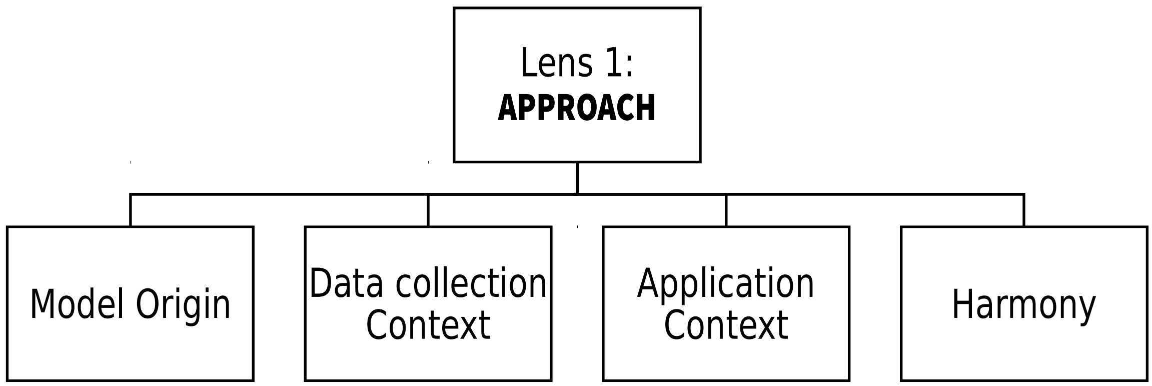


4.2.1 Approach

The first lens of the systemic analysis seeks to answer the following question: Is the approach used in the article in harmony with the application of the built model (approach and use)?

To answer this question, one first needs to identify the approach chosen by the researcher to deal with his or her research problem in the analyzed article. Four aspects are considered to reach this understanding and therefore answer the question, these are shown in figure 19 below.

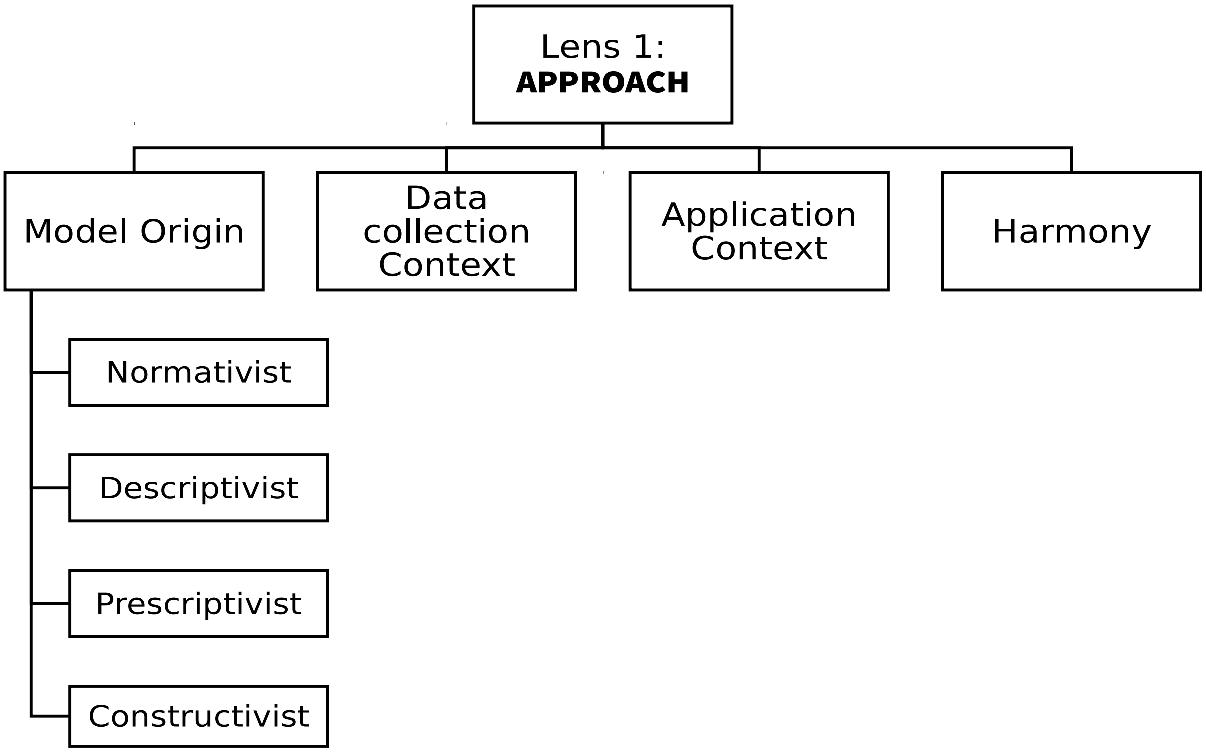
Figure 19 - Evaluated Aspects in Lens 1 (approach)



According to Lacerda, Ensslin, and Ensslin (2012) synthesizing Roy (1993) and Melão et al. (2000), an approach is a "world view" that influences the way the researcher perceives the research context, making him/her to value certain aspects in detriment of others. The adoption of a determined approach thus influences all the work of research, and consequently its results.

Literature presents four types of approaches, illustrated in Figure 20: (i) Normativist; (ii) Descriptivist; (iii) Prescriptivist; and, (iv) Constructivist. (Dias & Tsoukiàs, 2003; Leonardo Ensslin, Giffhorn, et al., 2010; Keeney, 1996; Roy, 1993); (Dutra, Ripoll-Feliu, Ensslin, Ensslin, & Gonçalves, 2015; Rogério Lacerda et al., 2012; Melão & Pidd, 2000).

Figure 20 - Types arising from the origin of performance measurement models



Source: Rosa, 2015

The normativist approach is guided by rationalism, that is, the researcher is responsible for selecting the model that will be used for the performance measurement to be developed, with the existing literature on the subject (science) and/or the knowledge of experts (his/her or third party) as the main sources of the variables that will compose this model. The model generates "optimal solutions", in such a way that the decision maker must accept its results, otherwise, when deciding differently from the model, he/she may be considered irrational and the decisions taken are considered wrong.

The descriptivist approach is also backed by rationalism, charging the decision maker with the task of identifying, in the physical context to be evaluated, the variables that influence the desired result. Once again, it is necessary to accept the consequences of the model, in view of the belief that the results of the past will occur again in the future. In this bias, both the physical context, object of evaluation, and the decision-maker (in a limited and non-mandatory manner) provide the variables considered in the model.

These two types of approaches (normativist and descriptivist) are associated with the decision-making process and are referred to as realists by Roy (1993), while the other two approaches presented below (prescriptive and constructivist) are pertinent to the decision aid process, according to the same the author (Roy, 1993).

In the prescriptivist approach, the concerns encapsulated in the evaluation model are derived from the decision-maker, during a facilitator-focused learning process. Thus, with the conviction that the decision maker has sufficient knowledge about their problem, the facilitator conducts the process in order to identify, in the decision-maker discourse, variables that should integrate the model to be built by him and validated by the decision maker. This approach has the decision maker as the central data source, however, with the knowledge being built in the facilitator.

The constructivist approach, on the other hand, assumes the premise that the model variables, their scales and their integration should emerge from the decision maker. However, in a different way from prescriptivism, the facilitator acknowledges that the decision maker is not fully aware about his problem and so he/she should be supported in a process of expansion of this understanding, aimed at identifying the association of its values, and preferences with the properties of the context. That is, the knowledge is built into the decision maker. Similar to the prescriptivist approach, the source of the variables considered in the model is the decision-maker, though he now has expanded knowledge with the support of the facilitator.

Table 9 below summarizes these approaches and their main characteristics.

Table 9 - Approaches to model decision contexts and some of their characteristics.

Characteristics	Approach			
	Normativism	**Descriptivism**	**Prescritivism**	**Constructivism**
Participation of the Decision-maker in the construction of the model	Little or none		Total, the model contains what is important for the decision-maker to monitor and improve.	
Building knowledge in the Decision-maker	Draws on existing knowledge from similar contexts.		Generation of knowledge in the decision-maker.	
Who legitimizes the Model and says whether the model is appropriate	Legitimation is external to the context where decisions are made.		The decision maker legitimizes. Informs that the model represents exhaustively and sufficiently what is important in the context.	
Who the model proposes to help	The model is generic. Can be used by all decision-makers in similar contexts.		The model represents the perception, values and preferences of the decision-maker, so it is only recommended for the decision maker who built it.	
Type of decision it intends to favor	Decision making		Decision aid	
Function of the facilitator /consultant/analyst	To find the appropriate model and its optimal solution, that is, one that all the decision-makers should use.	To develop the way decision-makers decide in practice as deeply as possible and thus select and use successful practices.	To listen to the decision-maker and guide his/her discourse to eliminate inconsistencies and learn the decision-maker's perception during modeling and with continuous legitimization by the decision-maker.	To dialogue with the decision-maker and through processes, expand the decision maker's understanding of how the context and its social relationships affect his/her value system, while the facilitator models the evolution of the decision maker's knowledge and he/she continually legitimizes it.

Source: (S. R. Ensslin, Ensslin, Chaves, Gabriel, & de Oliveira, 2014).

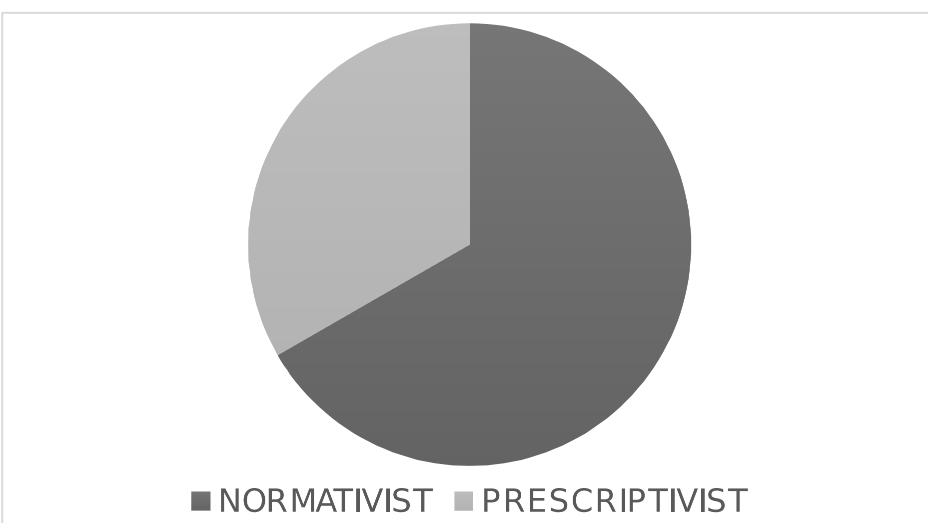
Having established this initial understanding of the approaches and origin of the data that integrate the respective constructed models, it is possible to proceed to the analysis of the articles in the Portfolio Bibliographic with regard to this lens.

Bakar et al. (2009) used questionnaires to identify important information from the decision maker (highy experienced administrators and doctors) and from this; the facilitators could design the model. Thus characterizing a prescriptivist approach.

In Lega et al. (2013), the authors draw from a vast literature review, information necessary to create the performance evaluation framework in an Italian case. Being been based on theoretical categories from literature, the study approach was therefore classified as normativist in nature.

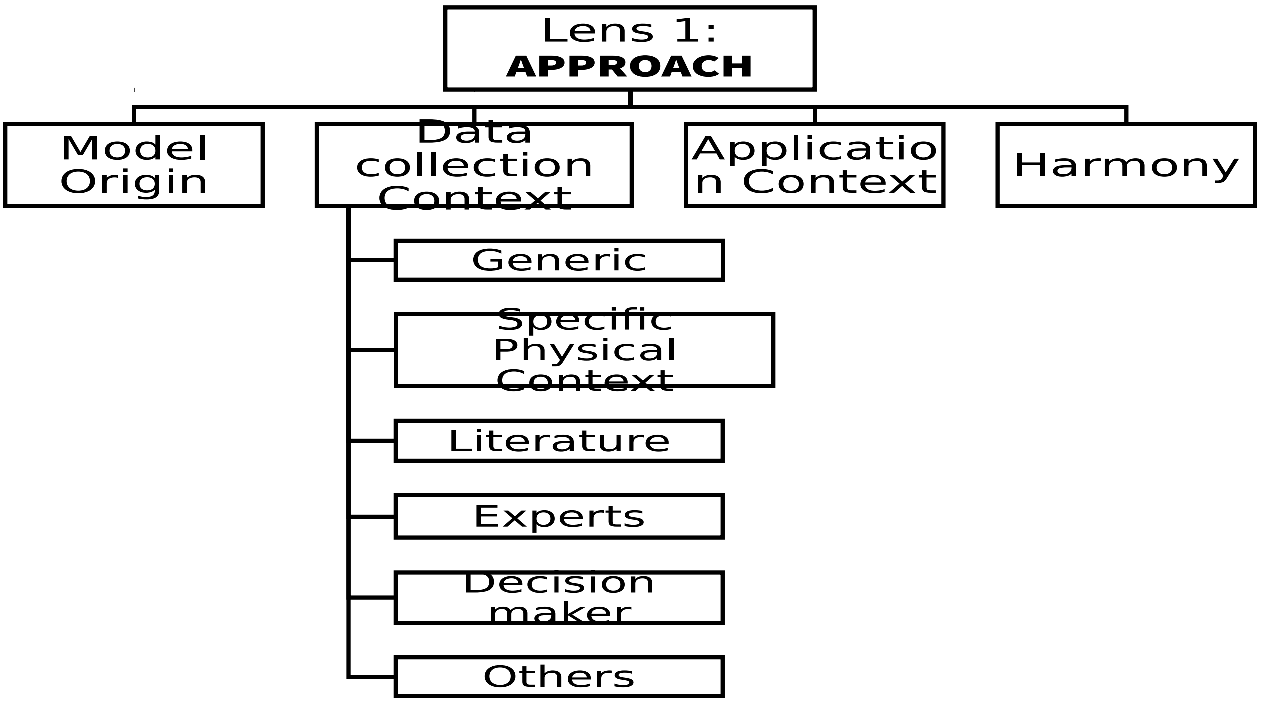
Supeekit et al. (2016) used information from literature to identify important aspects to be considered when designing their model. The authors then used expert opinion for pair-wise comparison of factors through DEMATEL. The approach utilized in this study can thus be classified as normativist approach since current literature is used to list the performance evaluation factors to be investigated. Figure 21 below shows the results of the analysis of the approach used I the BP articles.

Figure 21 - Approaches of the BP articles



After the analysis of the origin of the model, the second element of lens 1 was analyzed. This takes into account the context from which the data used in the model was collected. The contexts are shown in Figure 22 below.

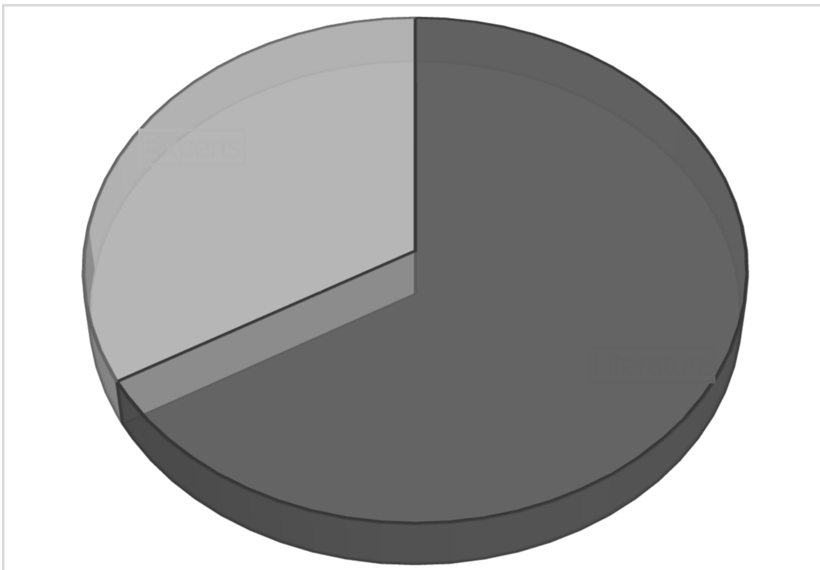
Figure 22 - Contexts from which data are collected for use in performance evaluation



Azevedo et al. (2011) highlight the following contexts as reference for data collection to be used in performance evaluation:

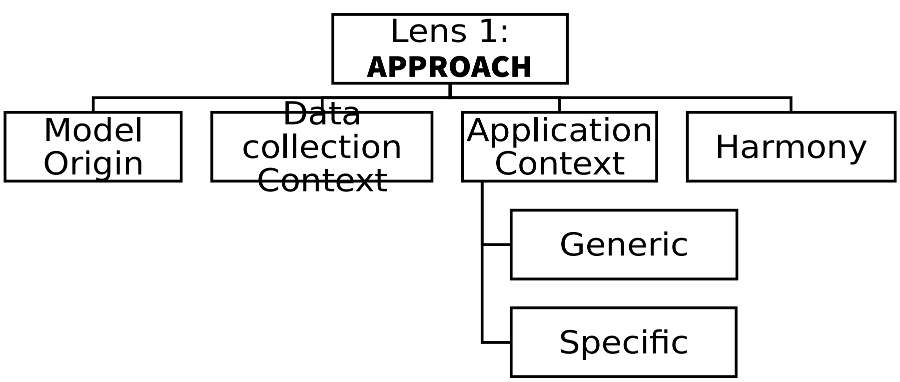
a) Generic - data is collected in contexts similar to the one used for constructing the model.
b) Specific physical context- data is collected from the environment (context) for which the model was developed.
c) Literature (science) - data is collected in publications that address the theme or context under study.
d) Experts - data is collected from individuals with recognized professional and/or academic knowledge in the area under study.
e) Decision maker - data is collected from the decision maker.
f) Other forms not related in this research.

Figure 23 - Classification of BP articles per source of data collection.



Having defined the analysis of the context of data collection for use in the performance evaluation model under study illustrated in Figure 23 above, the analysis of the third aspect evaluated in lens 01 was carried out, relating to context where the performance evaluation model is applied (used) (Figure 24).

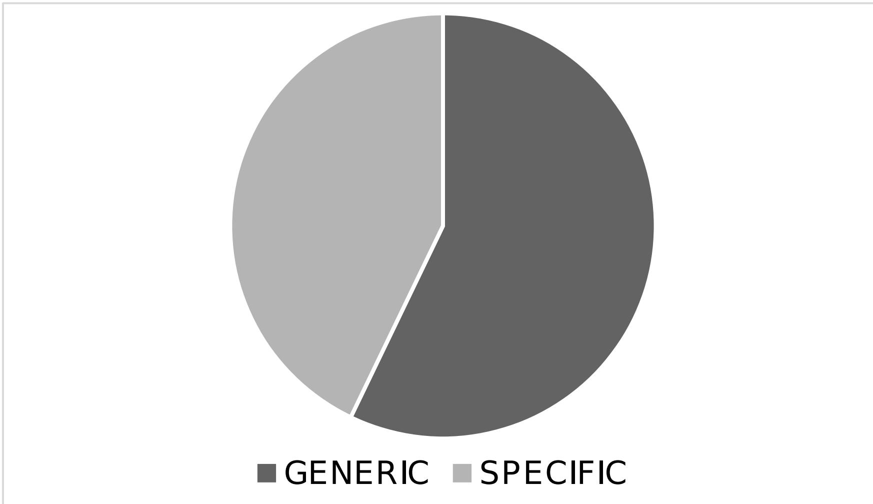
Figure 24 - Contexts where performance evaluation models are applied



Regarding the aspect of the context evaluation where the performance evaluation model constructed is applied or used, Azevedo et al. (2011) states that the models can be applied/used in a generic form, i.e., the same model can be applied in a number infinite contexts similar to those in study; or specifically, reference to the context of origin of the model and/or its data.

As a product of these analyses, a graph is constructed that evidences the classification of articles in the bibliographic portfolio regarding where the model is applied, as seen below.

Figure 25 - Classification of the BP articles by model application context.



Finally, the fourth analysis performed in lens 1 seeks to identify, based on the information collected, whether or not there was harmony between the construction of the model and its use according to Ensslin et al. (2010). In order to confirm the harmony between the model origin and the application, the authors based their conclusions on (J. E. Tasca, Ensslin, & Ensslin, 2013), as can be seen below.

Table 10 - Approaches and their uses/applications for the identification of harmony

	APPROACH	APPLICATION /USE	HARMONY
A	REALIST (NORMATIVIST OR DESCRIPTIVIST)	GENERIC	YES
B		SPECIFIC	NO
C	PRESCRIPTIVIST OR CONSTRUCTIVIST	GENERIC	NO
D		SPECIFIC	YES

The combination A and D encompasses articles that show harmony between their approach and their use, referring then to articles of realistic approach and generic use and those of prescriptive or constructivist approach and specific use. In turn, the combination B and C represents the group of articles that does not have harmony between approach and use, thus comprising articles of approach realistic and specific use and articles of prescriptive approach or constructivist and generic use.

As it can be observed in the table above, there is harmony when a model of realist (Roy, 1993) approach makes is applied generically, while a prescriptivist or constructivist model is harmonious when used for a specific purpose, one that it was originally designed for. The summary of the bibliographic portfolio of the present study is shown on table 11 below. From the data presented, it is concluded that no harmony was identified in the portfolio of the theme under study. This can be identified as a research gap that can be explored by designing a model that meets the requirements indicated in the literature.

Table 11 - Summary of the bibliographic portfolio

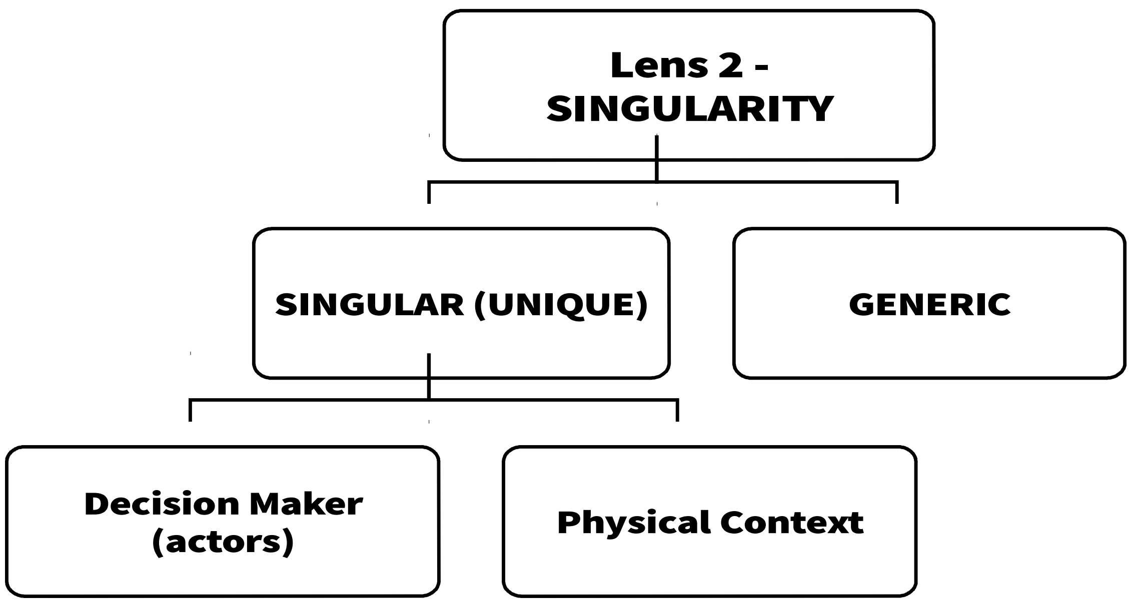
Articles of the bibliographic portfolio	Model Origin	Data collection	Application/use	Harmony (Model origin x Application)
Measuring supply chain performance among public hospital laboratories	Prescriptivist	Literature	Specific	Yes
DEMATEL-modified ANP to evaluate internal hospital supply chain performance	Normativist	Literature	Generic	Yes
An evaluation framework for measuring supply chain performance in the public healthcare sector: evidence from the Italian NHS	Prescriptivist	Experts	Specific	Yes
Performance assessment and benchmarking in the public sector: An example from New Zealand	Normativist	Literature	Generic	Yes
Procurement performance measurement system in the health care industry	Normativist	Literature	Generic	Yes
Squaring the circle of healthcare supplies	Normativist	Literature	Generic	Yes
Using MCDA to evaluate the performance of the logistics process in public hospitals: the case of a Brazilian teaching hospital	Constructivist	Experts	Specific	Yes

4.2.2 Singularity

In the definition of performance measurement as a decision aid tool presented at the beginning of this section and that supports this systemic analysis, it is evident that it is a process that is designed "to build knowledge in the decision maker, regarding the specific context that one proposes to evaluate…" (Ensslin et al., 2010).

When referring to a "specific context", this worldview points to the paradigm of singularity, which is opposed to generic models. Moreover, the notion of context involves two dimensions: the decision maker (actors) and the physical context.

Figure 26 - Classification of performance measurement models for singularity



Source: Adapted from Ensslin et al. (2010).

The analysis proceeding from lens 2 – singularity and shown in Figure 26 above, initially sought which articles were characterized as singular, that is, the articles in the bibliographic portfolio set to answer the following question: Does the article recognize that the problem is unique (actors and physical context)?

Lega et al. (2012) held interviews with decision makers who included the CEO and functional managers, to identify the performance aspects to be evaluated. The physical context involved a public hospital network which comprised of 17 different units. The authors state that the results obtained could not be generalized, and were thus unique to the ESTAV network, thus characterizing a singularity nature.

Supeekit et al. (2016) only uses the decision maker for pairwise comparison while the evaluation aspects are all derived from literature. The physical context, performance aspects and actors, and the model are consequently considered to be generic. The framework developed therefore does not present any characteristic of singularity.

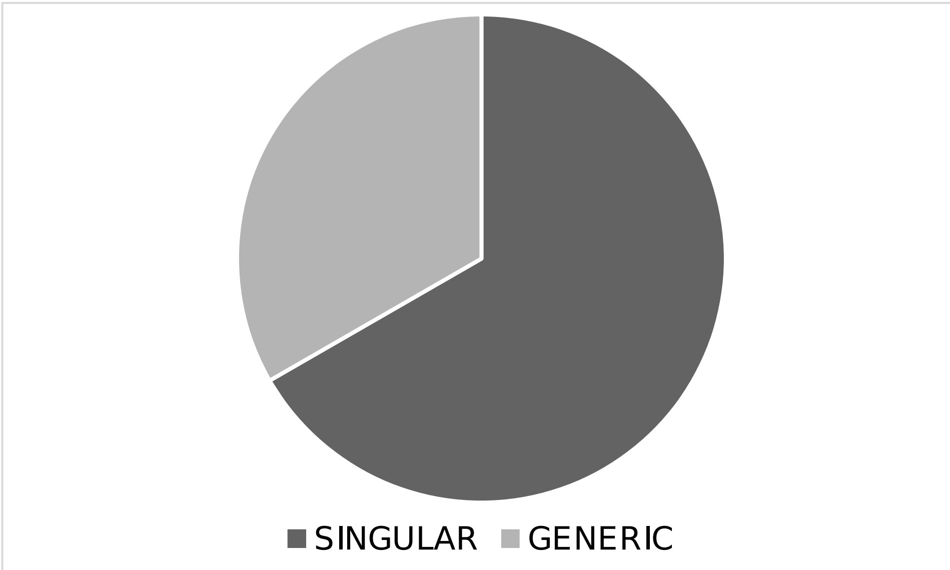
Bakar et al. (2009) measured the supply chain performance of two hospital laboratories. The data was collected from decision makers, thus signaling singularity. Further on, the authors alert that the model created cannot be used generically and the results can serve a specific physical context. This therefore confirms the singularity nature.

Longaray et al. (2018) used a unique decision-maker, and worked on a single case study to present their model. They indeed alert that the model constructed is unique to the context for which it was created.

Wynn-Williams highlights the role of benchmarking to overcome public sector performance assessment. However, they present a theoretical model and singularity characteristics is not shown.

Bohme et al. (2014) used a team of experienced researchers to collect specific data and thus present singularity characteristics. Their model can be generalizes as well since, as they alert, it was performed with few cases.

Figure 27 - Articles of the BP articles that developed generic or singular models



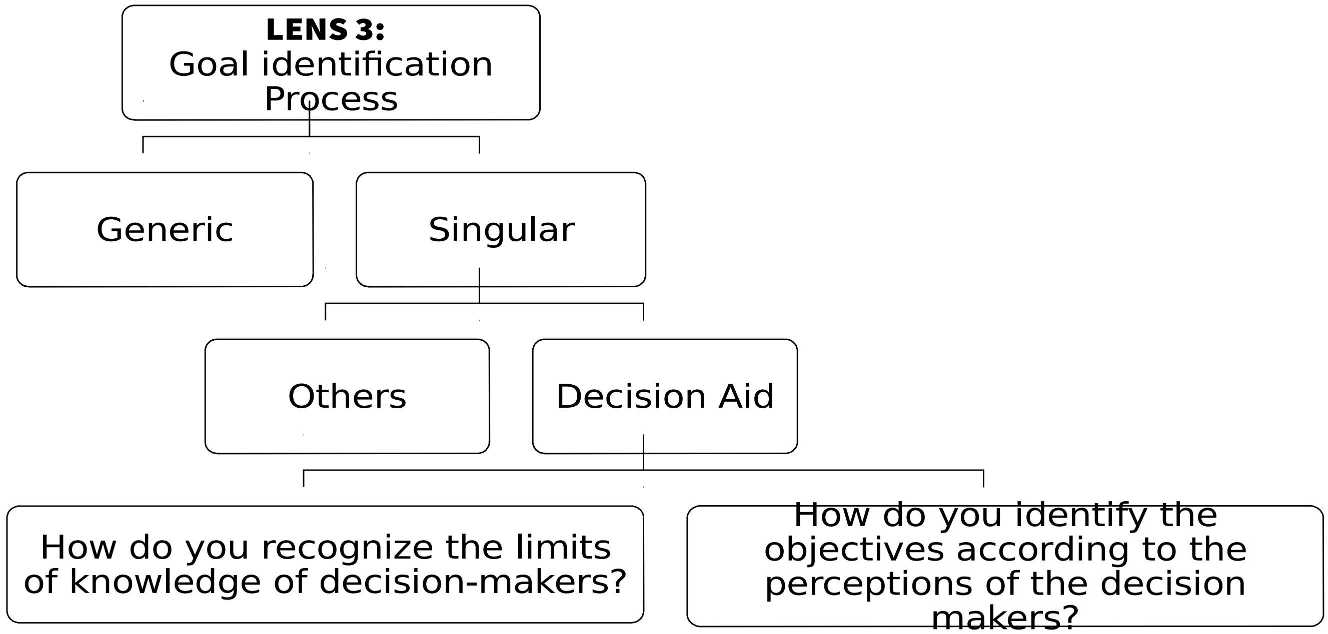
At the end of this analysis on singularity, shown in Figure 27, it is possible to emphasize that, with the exception of decision-makers are perceived in the context, but not to the point of being effective actors in the process of constructing the model, which leads one to believe that although authors have indicated that their articles are of specific use, the authors admit that their models could be used in other contexts.

Thus, an opportunity arises in the present research in this second lens of the systemic analysis to construct a singular performance evaluation model that not only explicitly identifies the decision maker at work, but also takes into account both the consideration of preferences and values, for the integral construction of the model, besides developing this model for a specific physical context that will have its characteristics incorporated according to the perception of the decision-maker.

4.2.3 Goal identification Process

The third objective was to identify the criteria used for the performance evaluation according to the perception of the decision makers. To this end, one seeks to identify the portfolio articles that recognize the knowledge limits of the decision maker; and how they proceed to identify such criteria.

Figure 28 - Identification of objectives according to the perception of the decision maker



Source: Adapted from Ensslin et al. (2010)

The identification refers to the need to incorporate the goals of the decision maker, his desires, values, concerns and preferences in the evaluation model, this can be seen in Figure 28 above. From the results obtained with the analysis performed on lens 2 - singularity, the author seeks to identify how the knowledge derived from the application of the models classified as singular is directed, i.e., if the aim of the constructed model is decision support or another purpose.,

For the purposes of this research, the knowledge limits of decision makers are directly related to the constructivist paradigm (Roy, 1996), considering that decision is a process carried out over time, through interactions between the preferences of actors impacted by a problem or context. Associated with this concept, the studies by Ensslin et al. (2001) are highlighted, when a problem is constituted in a situation that is no longer considered as equal by all actors (real problem) and is built before the interaction of these actors (each decision maker constructs his own problem).

Longaray et al. (2018) was the only article of the portfolio that considered it important to enhance the knowledge of decision-makers on the variables that should be considered in a performance evaluation model, the rest of the studies do not consider this.

From these observations and the world view adopted by this author, the model for the evaluation of the supply chain management of public hospitals should be built by enhancing the decision-maker's knowledge to improve their understanding on the context or problem to be addressed.

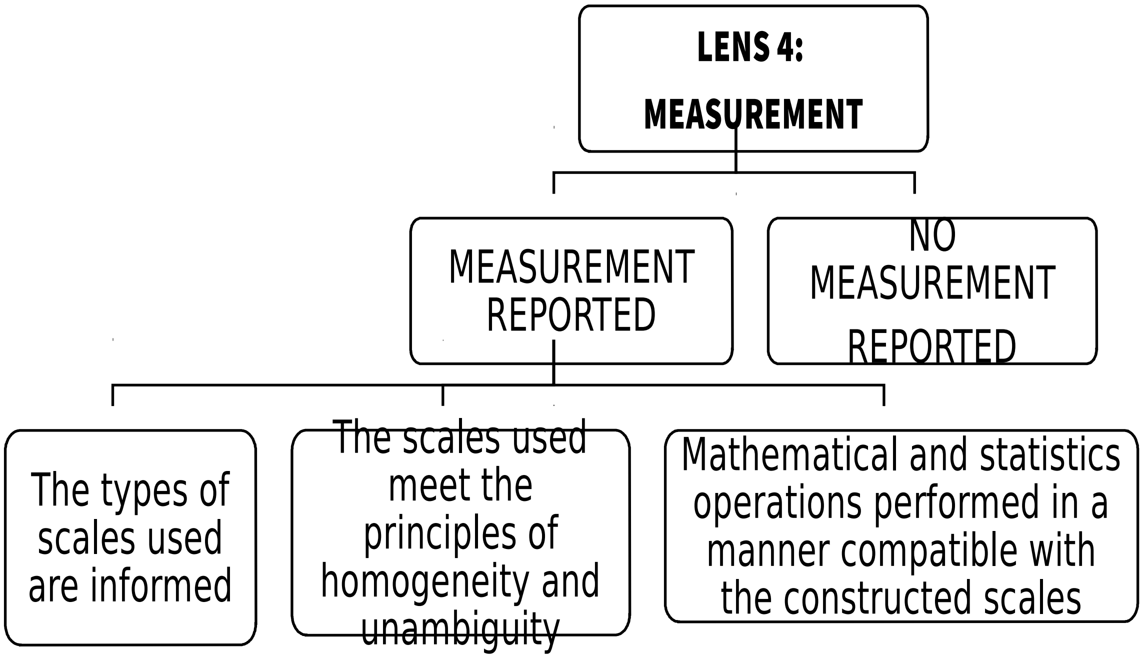
The second analysis performed in this lens refers to the identification of how the criteria used for the construction of performance evaluation models emerges from the context under study, and the authors report that none of the articles in the portfolio uses a process that leads to the identification of objectives integrally based on the values of the decision maker.

4.2.4 Measurement

The fourth lens used for the systemic analysis of the selected bibliographic portfolio refers to how the article measures the performance of the objectives. The purpose is to answer the following question: Do the scales used correspond to the Theory of Measurement and the properties of Homogeneity and Intelligibility?

For this, the identification of portfolio articles that perform some type of measurement is initially performed. For the articles that carry out the measurement, 3 analyses are established, as seen below.

Figure 29 - Process to identify how the performance of objectives is measured.



Source: Adapted from Ensslin et al. (2010)

For a better understanding of what is being analyzed in the articles of the Bibliographic Portfolio about measurement, it is important to decompose the above question into each of the dimensions considered, using the Ensslin, Montibeller and Noronha (2001) and Giffhorn (2011) as reference. A scale is the central element of a performance indicator, in view of the fact that it is makes it feasible to measure the factual properties of the context under evaluation, being expressed by a set of numbers or symbols associated to the possible performances of one or more properties of the context.

There are four types of scales, presented below following the evolution of knowledge they generate on the properties they wish to measure:

Table 12 - Types of scales according to Bortoluzzi et. al (2011)

SCALE	Description
Descriptive	Represents the properties of the context through a discourse, a narrative that shows people's perceptions about what one wants to know
Nominal	Adds new information by qualitatively classifying context properties into

	distinct categories, without establishing a preference order between them.
Ordinal	Advance because they establish an order of preference among the categories that make up each scale, not allowing, however, the appreciation of the attractiveness of passing from one point of the scale to the other.
Cardinal	Divided into interval scales that bring with them all the characteristics of ordinal scales, adding, the quantification of the difference between the levels of the scale, a situation that raises the level of knowledge generated. When the zero of the cardinal scale is associated with an absence of measurement, the scale is referred to as a ratio scale, and when the zero is arbitrary, the cardinal scale is said to be an interval scale.

In addition, it is important that the scales used in the articles of the Bibliographic Portfolio attend the Theory of Measurement and its properties of Homogeneity and Intelligibility.

The theory of measurement seeks to identify the statistical operations appropriate to each of type of scale. In the case of ordinal scales, the permitted statistical operations are counting, mode, frequency, and median. Thus, the use of mean in ordinal scales denotes that the Theory of Measurement was not met.

To meet the requirements of the Theory of Measurement, the analysis undertaken aims to observe only the following characteristics in the scales used:

(i) Homogeneity - scale levels refer to the same context properties;

(ii) Intelligibility - everyone measuring that property will reach the same result, the scale is unambiguous.

The other properties, Measurability, Operationality and Distinction of the best and worst performances were not analyzed in this study and remain as opportunities for future analysis.

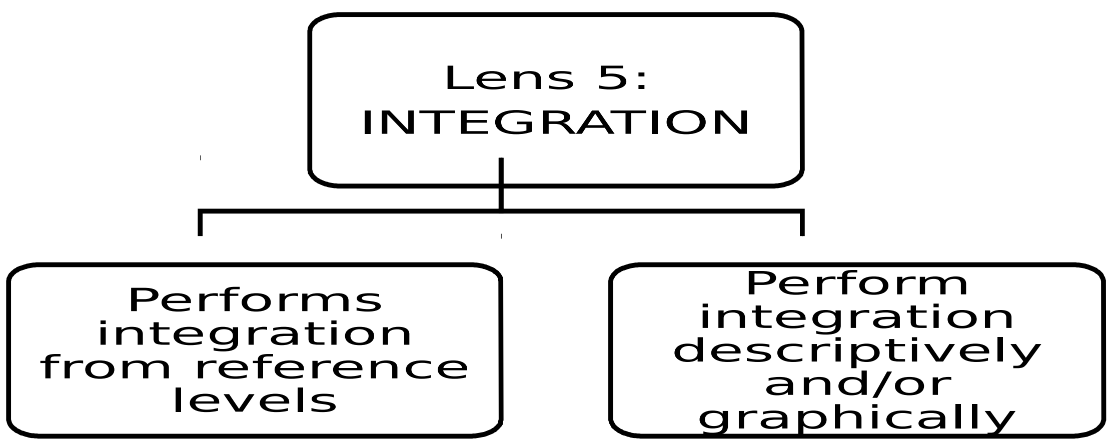
Having established this initial reference, it is observed that Bakar et al. (2009) make use of an ordinal scale. They however ignore the theory of measurement by calculating mean values. Lega et al. (2013) also use ordinal scales but their framework does not offer further detail as to characterize the requirements of the theory of measurement. Their emphasis is based on a theoretical framework. Supeekit et al. (2016) and Longaray et al. (2018) employ a cardinal scale in their work to evaluate performance. Supeekit et al. (2016) use causal relationships to determine weights of performance experts, while Longaray et al. (2018) made use of substitution rates.

It is confirmed that all articles that compose the Portfolio performed measurements in one way or another, however, only Bakar et al. (2009) and Longaray et al. (2018) provide information about the type of scale used. On the properties of homogeneity and unambiguity, Only Supeekit et al. (2016) and Longaray et al. (2018) respected these properties, while the other articles presented elements contrary to the requirements of the theory of measurement.

4.2.5 Integration

The fifth lens of systemic analysis, illustrated in figure 30, is about the integration of the evaluation criteria in such a way that an overall assessment of the context is possible. This is because performance evaluation as a decision support instrument presumes the execution of this activity as another moment of knowledge construction of the decision maker.

Figure 30 - Process to identify how the integration of the criteria is done



Source: Ensslin et al. (2010)

In addition to the concern to identify whether there is integration in the articles, or whether it is carried out descriptively and /or graphically, this lens seeks to determine if the process establishes integration constants from reference levels. This concern arises from the need to avoid what Keeney (1992) claims to be the most common critical mistake in this initiative, i.e., the importance of the criterion should be relative and associated to the reference levels of the scale – a change in the levels, consequently changes the integration constants.

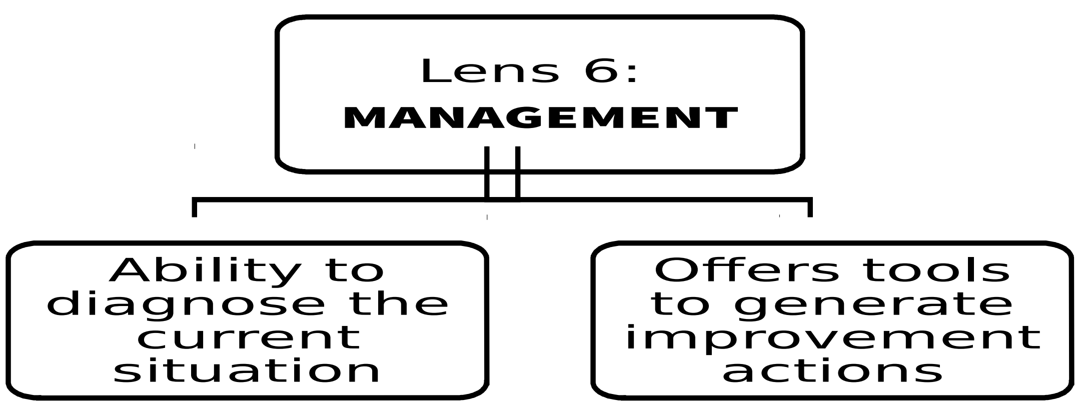
In the Bibliographic Portfolio of the present study, Supeekit et al. (2016) performed the integration from the reference levels, using low and high, while Longaray et al. (2018) used Neutral and Good reference levels for integration. The rest of the articles were integrated graphically. Due to these findings, an opportunity for research arises, based on the adoption of an evaluation model that allows the integration of performance indicators by means of constants associated with the reference levels of the scales.

4.2.6 Management

The last lens of the systemic analysis (Figure 31) has the purpose of observing the concern of the evaluation model as a management tool aimed at improving the context. Thus, allowing the decision maker, as the final moment of the process of knowledge construction, to diagnose the current situation (aspects with adequate performance and compromising performance), generate actions of improvement and measure the contribution of the improvements made.

Thus, the first aspect observed in the articles was the ability of the model to make a diagnosis of the current situation, providing knowledge of these aspects of the context.

Figure 31 - Process to verify if the knowledge generated allowed knowing the current profile, its monitoring and improvement



Source: Ensslin et al. (2010)

With the exception of Longaray et al. (2018), none of the BP articles herein proposes to demonstrate in a clear and concise way the current situation evidenced by the model showing strengths and weaknesses. Supeekit et al. (2016) tries this by identifying the aspects that need the attention of the decision-maker. Bakar et al. (2009) make a timid attempt at highlighting the aspects of the model that need attention, without generating any actions of improvement. Lega et al. (2013) hardly mention the current situation of the object of performance evaluation and neither do they identify any actions that can bring improvements to the management of the Italian NHS. Longaray et al. (2018) carry out a diagnosis of the current situation and offer tools to generate improvements thus satisfying this lens.

It is important to highlight that for each of the lenses mentioned above, the strengths and opportunities resulting from each analysis are uncovered, availing the knowledge about the current trends for the theme and the delimitations encountered.

Scientific production has shown great growth in the last decades and indicates signs of continuing to rise in the coming years, probably a result of globalization and the advent of better technology. Though the researcher now has more information at his disposal, he/she is unable to take advantage of all available information, making it is necessary to selectively choose what to be considered or not in his research. The difficulty of establishing selection criteria and following a rigorous process in the search for relevant information stress the importance of making use of an objective methodology in the selection of bibliographic references for scientific research.

The detailed literature review carried out herein reveals a poorly explored area of research, despite the importance that the results could bring to public management. Few studies have been published on the performance measurement of public-sector operations, and even fewer have constructed models that serve as decision aid to the public decision-maker. Though complex in nature, the public sector is a rich area of research that can foresee efforts of contribution to efficient public management.

From the results found by using the Proknow-C process, it is possible to find gaps and research questions that can be translated into advances in this field of research if used as a foundation for further research. This is considered as the last macro step in the ProKnow-C knowledge construction process, which has proved to be an effective tool in the selection of information, leading the researcher to follow a clear and objective methodology with scientific rigor. Table 13 below summarizes these research questions through challenges for the researchers as well as public-sector supply chain managers.

The research question thus established is: How can performance evaluation, in its decision aid character, contribute to the supply chain management of public sector healthcare, in terms of approach (harmony), singularity, identification, measurement, integration and management. Specifically, how can one operationalize a model that meets the requirements contained (wanted) in the definition of performance evaluation? To answer this research question, the general objective proposed in the present work is to develop a performance evaluation model that aids the supply chain management of a public hospital.

Table 13 - Research questions after ProKnow-C

Lenses of Analysis	Researcher Challenges	Public-Sector SC Manager Challenges
Approach	How can one enable the structuring of a constructivist model of performance evaluation in supply chain management of a public hospital, taking into account a specific environment of application?	How is it possible to find the model's limits and boundaries of management performance in order to only consider the necessary objectives for evaluation?
Singularity	How can one conceive a public hospital SCM performance evaluation model based on decision makers and geared towards public-sector organization?	How can one transform strategic organizational goals into useful and measurable performance indicators?
Identification Process	How is it possible to enhance the knowledge of decision makers at all stages of development of a public hospital performance evaluation model, from the identification to the operationalization of criteria? How can one develop a public hospital performance evaluation model that is fully based on the values and preferences of decision-makers?	How can one delegate the monitoring of performance indicators to the work team, and monitor data collection and validation?
Measurement Process	How can one organize a public hospital performance evaluation model that	How can one organize and define the frequency with which to evaluate and

	measures ordinally and cardinally and that has all the properties of operationality, measurability and non-ambiguity? How can one structure a public hospital performance evaluation model that allows to identify the best and the worst performance?	re-validate the PE indicators?
Integration Process	How can one consider the perceptions of decision-makers in the integration of performance indicators, identifying reference and integration levels? How can one perform the integration process in a descriptive, graphic and cardinal manner using reference levels? How is it possible to integrate the scales of measurement of a performance evaluation model in the public hospital SCM based on the perception of decision makers, providing a holistic view of performance and the partial and total results?	How can one explain data in an integrated manner, so that it is available to all stakeholders?
Management Process	How can one structure a model of performance evaluation that shows an analysis (*status quo*) of the current public hospital SCM performance graphically and/or numerically and illustrate performance weaknesses and strengths? In a public hospital SCM performance evaluation model, how can one identify a process that creates, identifies and organizes improvement measures as a hierarchy structure?	How can one present all the collected data to the organization and motivate the stakeholders so that all undertake improvement measures?

Source: Adapted from (Thiel et al., 2017)

Decision making in the public sector needs to adopt performance evaluation as a management tool, which can be applied to many other operations, which, similar to SCM, make use decision-making processes that take multiple criteria into account and fulfill the needs of stakeholders. Scientifically, the present study sets out as a starting point for researchers to propose new performance evaluation metrics in the public sector, little explored in the existing literature.

Considering the identified objective, research gap and the theoretical affiliation on performance evaluation adopted in the present study, the next step therefore is to carry out the case study using MCDA-C, as the tool of intervention and construct a performance evaluation model to support the management of public hospital supply chain based on the world view adopted. The object of study will be the Hospital Universitário Dr. Miguel Riet Corrêa Jr. - HU-FURG EBSERH of the Universidade Federal do Rio Grande – FURG.

5 CONSTRUCTION OF THE CONSTRUCTIVIST PERFORMANCE EVALUATION MODEL

As a research tool, the Multicriteria Decision Aid - Constructivist Methodology was selected to model the performance evaluation because it is an instrument that allows the decision maker to develop the necessary knowledge while recognizing the decision criteria which he most values (A. A. Longaray et al., 2015; J. E. Tasca et al., 2012).

The results of the case study are divided according to the MCDA-C phases: (i) Structuring phase; (ii) Evaluation phase; (iii) Recommendations phase.

5.1 STRUCTURING PHASE

According to Bana and Costa (1993) and Ensslin, Montibeller and Noronha (2001), the Structuring Phase is fundamental at the beginning of a decision support process, since characteristics and aspects arise in a confusing and disorganized way, thus the need to organize them so that they become clear and measurable. The Structuring Phase is composed of the stages of contextualization, hierarchical structure of value and construction of the descriptors. It is in this stage of the work that the participants of the context will be defined, the problem to be studied - which characterizes the purpose of the model - and the identification, organization and construction of the descriptors (Longaray et al., 2017).

5.1.1 Contextualization

The Contextualization step consists of the following activities: description of the environment, definition of the actors, label and summary. The construction of the evaluation model starts from the contextualization of the situation that presents opportunities for improvement according to the perception of a particular person or group of people. This contextualization has as starting point the definition of the actors involved with the problem in question. Ensslin, Montibeller and Noronha (2001) provide detail on actors who may be involved, directly or indirectly, in a decision-making context.

Stakeholders are the group directly involved in the construction of the model – these are composed of the decision maker - person or group of people responsible for the consequences of the decisions aided by the model and in whom the knowledge will be constructed - by the *demandeur* - actor that will be inserted in the context by the decision maker with the purpose of representing him in the process of model construction, considering his unavailability of time to interact with the facilitator; speaks on behalf of the decision-maker and is imbued with his / her authority - by the interveners - people who are able to interfere with the values and preferences of the decision-maker and who he or she therefore deems important to be heard - and by the facilitator - person or persons with mastery of MCDA-C and responsible for the construction of the model to generate knowledge in the decision maker. Those acted upon are the persons or group of people impacted by the decisions arising from the constructed model. (Bortoluzzi et al., 2010; Leonardo Ensslin et al., 2001; Zamcopé et al., 2010).

Figure 32 - Context Actors

Stakeholders	**Decision maker**	Administrative manager
	Interveners	Superintendent Expenses Authorizer Head of Administration Sector Head of Supplies
Facilitator		Authors of the study
Acted Upon		Community of the Southern Region of RS, other employees of the company, and suppliers.

Of these actors, the decision maker, the facilitator and the acted upon will be found in all MCDA-C applications, while the *demandeur* and the interveners will be present only when the decision maker deems necessary.

This study was developed at the Dr. Miguel Riet Corrêa Jr. University Hospital (HU - FURG), which since 2011 started to treat patients exclusively by the Unified Health System

(SUS). On July 17, 2015, FURG signed an agreement with the Brazilian Hospital Services Company (EBSERH).

The Administrative Management (GAD) is the unit of Dr. Miguel Riet Corrêa Jr. University Hospital (HU/FURG-EBSERH) responsible for managing and implementing administrative, budgetary, financial, equity and accounting policies within the hospital; by signing the financial processes for payment, after the analysis by the Expenditure Settlement Unit, submitting them to the deliberation of the Expenditure Authorizing Officer; and for managing and implementing logistics, hospital infrastructure, and people management policies.

Figure 33 shows the administrative structure of the Administrative Management (GAD) where the purchasing units and the supply sector stand out, which together manage the HU-FURG supply chain.

The model developed in this research was constructed according to the perceptions of the administrative manager through information obtained in semi-structured interviews. The facilitator guided the dialogue to ensure its objectivity and adherence to the topics proposed by MCDA-C. During this step, the authors avoided forming conclusions and identifying alternatives since the problem was not yet clear.

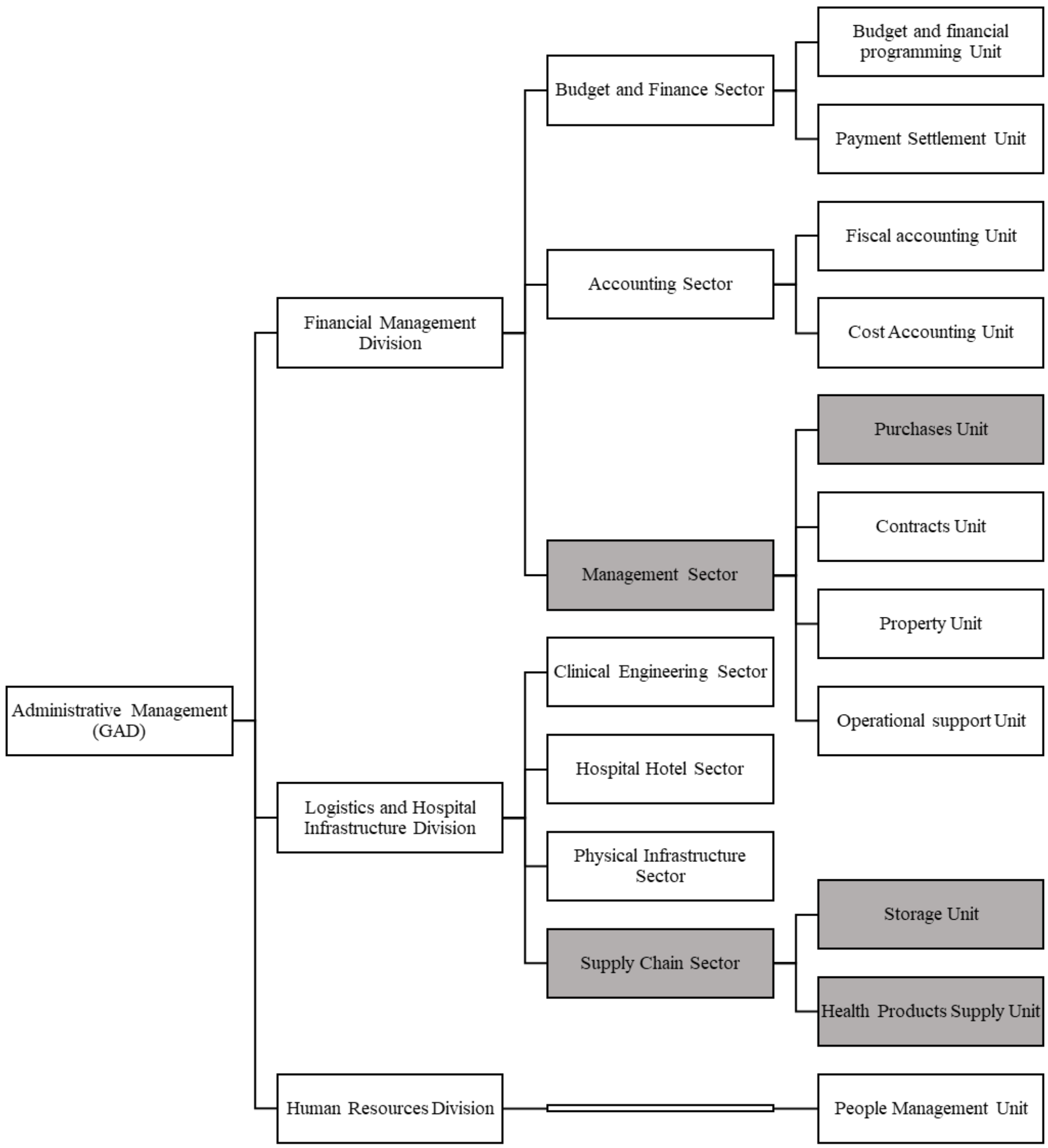
After the definition of the actors, the macro description of the environment where the problem is inserted was presented:

The Dr. Miguel Riet Corrêa Jr University Hospital (HU-FURG/EBSERH), is an organ linked to the Rectory of the Federal University of Rio Grande do Sul (FURG), it has the purpose of serving the implementation of public policies of SUS - Unified Health System - as well as promoting and encouraging development of teaching, research and outreach programs in the health area, aiming at the integration of teaching with assistance.

The HU was created by means of Federal Ordinance, in 1976, and initially installed in the Charity Association of Santa Casa of Rio Grande. The current building, which started only with the Emergency Care Service and the Medical Clinic Unit, now has a Surgical Center, General ICU, Surgical Clinic, Maternity, Obstetric Clinic, Pediatrics, Neonatal ICU, Day Hospital - AIDS and Day Hospital - Chronic Diseases, among others.

Currently, it is a hospital that attends 100% SUS and offers hospitalizations, consultations in the most diverse medical specialties, laboratory exams, imaging, besides opportuning the integral assistance through the complementary services provided by social workers, physiotherapists, psychologists, speech therapists, nutritionists and physical educators.

Figure 33 - Organizational Chart of HU/FURG-EBSERH Administrative Sector



Based on this initial knowledge, we proceeded to define a label for the problem, a title empathically defined with the decision maker, preferably containing no more than twelve words, and that synthesizes the decision-maker's dissatisfaction and what he wishes to do in relation to this situation. In the present work, the label was established as follows: A model to aid the management of the supply chain of HU-FURG/EBSERH.

Once the problem label was defined, the facilitator, together with the decision maker, defined the summary to present the context to be studied. The summary sought to: (i) present the problem; (ii) justify its importance; (iii) establish what the purpose of the work is; (iv) propose what to do to achieve the goal; and, (v) solve the problem and what are the expected results (Leonardo Ensslin et al., 2001).

Detailing the summary: The person responsible for the management of the hospital, sought to improve the management of the entire supply chain. The public nature of the HU-FURG means that it is an environment constrained by rules and regulations, thus making it unable to develop strategic supply chain partnerships. Public sector SCM serves a broader range of stakeholders, places greater emphasis on accountability and transparency, and allows little or no flexibility for negotiating with bidders/responders. The public procurement task for example, seeks to help user agencies obtain the goods and services needed to do their jobs, while controlling the process that spends large amounts of public funds. These processes involve many professionals; many of whom have their own individual goals. Furthermore, the fact that it is a Teaching Hospital means that there is heavy movement of medical and nursing students in the surroundings. Thus, the manager seeks by means of an instrument of decision support a way to evaluate the management of this supply chain. Such need arises because there is a limit to the financial resources awarded to the hospital each year, and to know how each process interacts with the SC means that management can be facilitated. In this way, this work seeks to supply the decision maker with a practical tool, through a model of performance evaluation and decision support, which allows the manager to structure his decision on good practices.

Therefore, this work proposes the development of a decision support model using the Multicriteria Methodology of Decision Support - Constructivist (MCDA-C).

At the end of the present work, the development of a decision support model based on the preferences of the decision maker is expected, identifying, prioritizing and mapping the critical work processes according to the indicators proposed by the model. After the definition of the model label and the identification of the actors in the context, the Primary Evaluation Elements, initial concerns of the decision makers, will be identified.

5.1.2 Primary Evaluation Elements and Fundamental Points of View

The identification of the Primary Evaluation Elements (PEEs) (ENSSLIN; DUTRA; ENSSLIN, 2000; ENSSLIN; MONTIBELLER; NORONHA, 2001) was based on the interaction of the facilitator with the decision-maker, in which the facilitator was motivated to discuss his management process, reporting on his concerns, desires and motivations. It is highlighted that, according to the decision maker, the management of a supply chain of a public health care institution, a teaching hospital to be specific, must encompass all factors that interfere and/or are affected. This means that the SCM must involve all major aspects.

This process culminated in the identification of 98 Primary Evaluation Elements. Considering that PEEs deal only with initial information on the problem of the decision maker, there is a need to expand their knowledge about each PEE identified (MATOS, 2014). Thus, the 98 PEEs were expanded into 427 concepts, from which the decision maker legitimated 228 of these as relevant to the decision context, being constructed with the goal of representation of the objective associated with each PEE. Initially, the Primary Evaluation Element was action-oriented (present pole), that is, the direction of preference of the decision maker; its psychological opposite pole, which corresponds to the minimum performance that the decision maker wishes to avoid, was then established, represented by the ellipsis (...) and which should be read as "instead of" (Leonardo Ensslin et al., 2001); Table 14 presents a sample of 10 PEEs and their respective concepts (A complete list of EPAs and concepts can be found in Appendix A).

Table 14 - Sample of PEEs and Concepts of the model

PEE	CONCEPT
Information system management	1. Reducing rework due to diverse data sources ... Find errors in the flow of information
University support	2. Receive support from the University ... Have difficulty solving problems
Competencies	3. Adapt professional expertise to the need of the sector ... Ignore the employee's professional training
New specialties	4. Expand the areas of specialties ... Transfer patients to other institutions
Group order items	5. Make the Mix attractive ... Lack supplier for that group
Ombudsman service	6. Minimize requests through the ombudsman's office ...

	Have a large volume of complaints, demonstrating dissatisfaction.
Involvement and Responsibility	7. Stimulate the commitment of employees ... have unproductive employees at the workplace
Institution Growth	8. Lead uniform growth in all areas ... Focus only in some specific areas
Interest of the population	9. Attend the population as best as possible ... Give excuses always, due to insufficiency
Fund raising from development agencies	10. Develop initiatives to raise funds from development agencies and other institutions ... Miss the opportunity to raise funds

Source: Research data.

Due to similarities of some concepts, it was possible to group them in eleven areas of concern, called Fundamental Points of View (FPVs): “Administration”, “Budget-Finance”, Hospital Infrastructure, “Information technology”, “Teaching”, “Purchases”, “Logistics”, “Politics”, “Legislation”, “Planning”, and “Human Resources management”.

With the identification of the Areas of Concern, Cognitive Maps were constructed through the organization and hierarchy of concepts and their influence relationships (Leonardo Ensslin, Giffhorn, et al., 2010; Leonardo Ensslin et al., 2001). It is emphasized that the structuring phase is a stage of constant learning and, for that reason, after each validation process the decision maker made changes and refinements in the model. Based on this activity, it is possible to expand the decision maker's understanding of each area of concern, so that the means concepts can be identified to the strategic concepts (Rogério Tadeu de Oliveira Lacerda et al., 2011).

The figure below shows the Cognitive Map constructed for the FPV “Logistics” (The maps constructed for the other FPVs can be seen in Appendix B).

Figure 34 - Cognitive Map of FPV "Logistics"

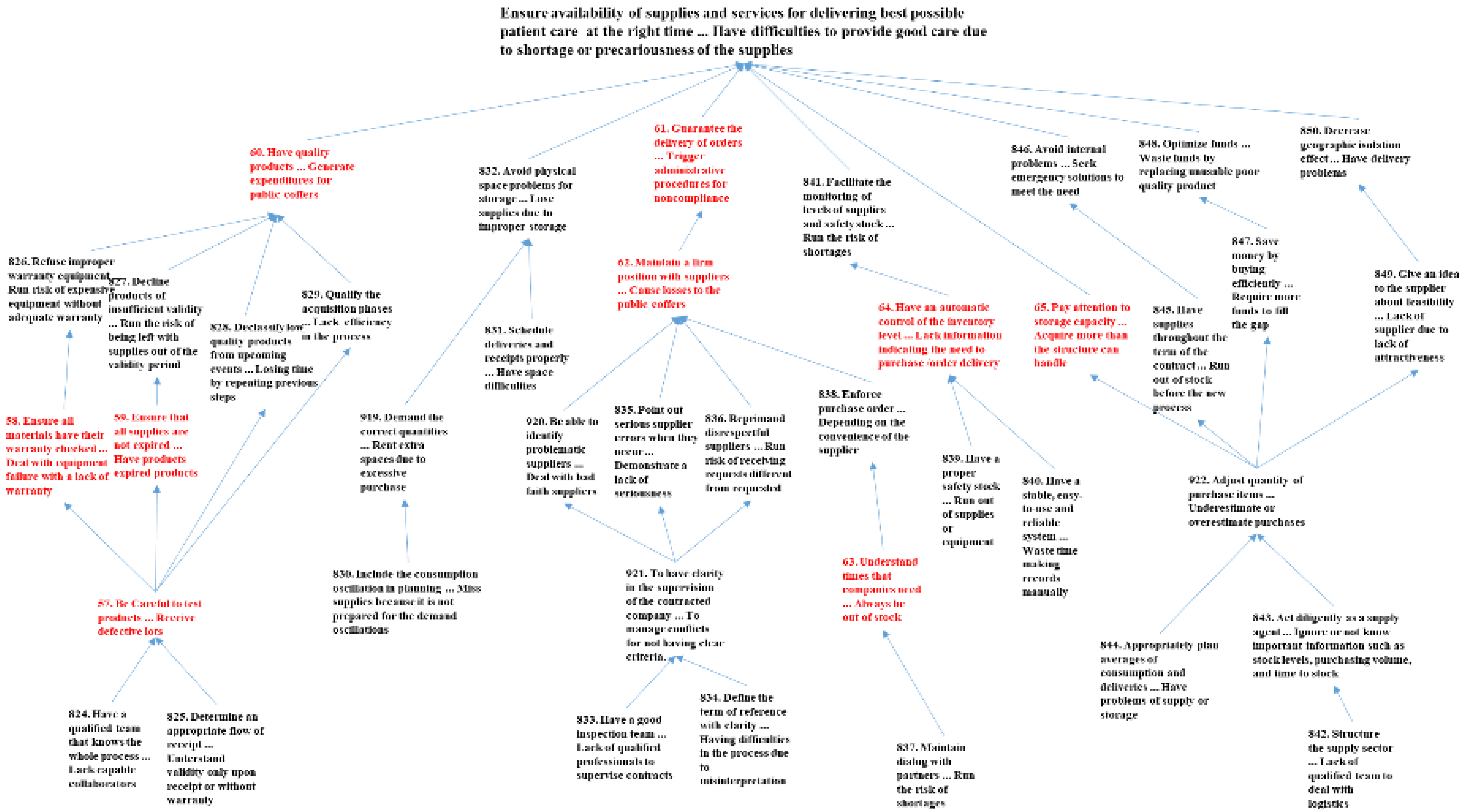


Figure 35- Groupings of concepts in Areas of Concern.

PERFORMANCE EVALUATION OF PUBLIC-SECTOR HEALTHCARE SUPPLY CHAIN MANAGEMENT AT HU-FURG/EBSERH

FPV	Head Concept	Concepts
Administration	Manage the institution with managerial competence ... Find difficulties in the day to day running of the hospital	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720
Budget & Finance	Have the resources to meet all institutional needs as they arise ... Work with at a capacity that impairs hospital care	16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 927, 928
Hospital Infrastructure	Strengthen hospital infrastructure and thereby improve the hospital environment and the quality of hospital services ... offer poor quality of patient care	27, 28, 29, 30, 31, 32, 33, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 925
Information technology	Provide the manager with an overview of all processes for decision making ... Lack the tools to support decision making	34, 35, 36, 37, 38, 39, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 926
Teaching	Provide a reference for high complexity health care , training of health professionals and technological development… Ignoring the taxpayer, responsible for public investment in vocational training	40, 41, 787, 788, 789, 790, 791, 792, 793, 794, 795
Purchases	Ensure the institution receives goods, services or works at the best possible price, when aspects such as quality, quantity, time and location are compared … Suffer due to shortage or purchases of poor quality	42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 923, 924
Logistics	Ensure availability of supplies and services for delivering best possible patient care at the right time ... Have difficulties to provide good care due to shortage or precariousness of the supplies	57, 58, 59, 60, 61, 62, 63, 64, 65, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 919, 920, 921, 922
Politics	Minimize the influence of politics in the hospital affairs ... Satisfy individual or group interests	66, 67, 68, 69, 70, 71, 72, 73, 74, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866
Legislation	Operate in compliance with legal requirements ... Commit or act with irregularities	75, 76, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877
Planning	Establish adequate strategic planning of hospital needs in all dimensions ... Always work without any planning	77, 78, 79, 80, 81, 82, 83, 879, 880, 881, 882
Human Resource management	Manage human capital to achieve organizational goals ... Fail to manage people correctly	84, 85, 86, 87, 88, 89,90, 91, 92, 93, 94, 95, 96, 97, 98, 885, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918

Cognitive maps were constructed, and it was possible to identify the similar concepts that make up the areas of concern of the decision maker. Thus, in order to facilitate the analysis process, the Cognitive Maps were divided into smaller maps, thus forming clusters, since the name given to each of them is the result of the decision maker's focus on the objective (Leonardo Ensslin, Giffhorn, et al., 2010; Leonardo Ensslin et al., 2001). After the identification of the clusters, these were transported to the HSV, as shown below. The clusters of the other FPVs can be seen in Appendix C.

The HSV of the other FPVs can be seen in Appendix D. After completing the HSV, the next step is to construct the descriptors.

Figure 36 - Clusters of FPV "Logistics"

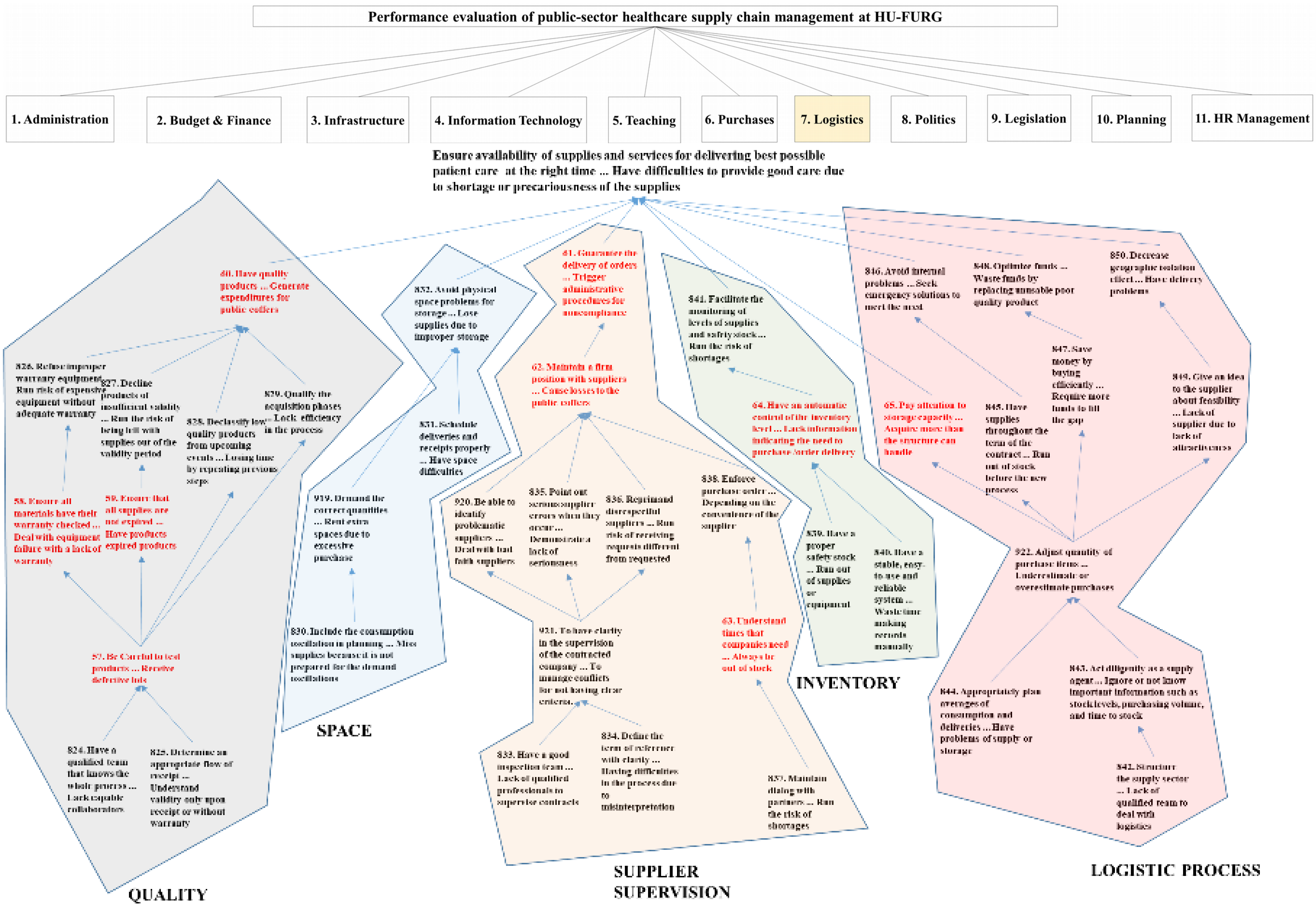
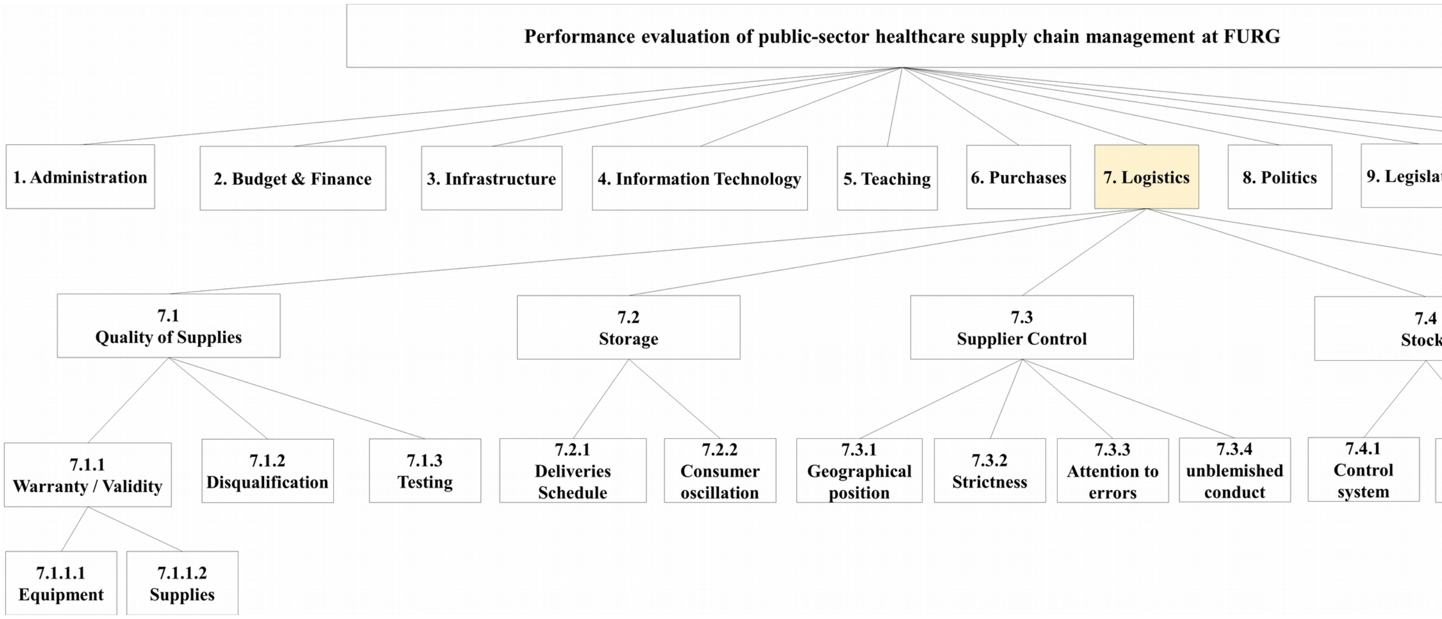


Figure 37 - Hierarchical Structure of Value for FPV "Logistics"

5.1.3



Construction of the descriptors of the model

The first step in the construction of the descriptors consists of establishing, along with the decision maker, the ordinal scales used to measure each point of view, respecting the principles of the Measurement Theory (legitimacy and validation), as highlighted by (Micheli & Mari, 2014).

In their work, the aforementioned authors report that the construction of scales must comply with the principles of legitimacy (ordinality) and validation (cardinality). Legitimacy, according to them, is presented by the requirement of objectivity, accuracy and precision, while validity is explained by the observance of the type of operation performed by the scales against the degrees of freedom admissible by it.

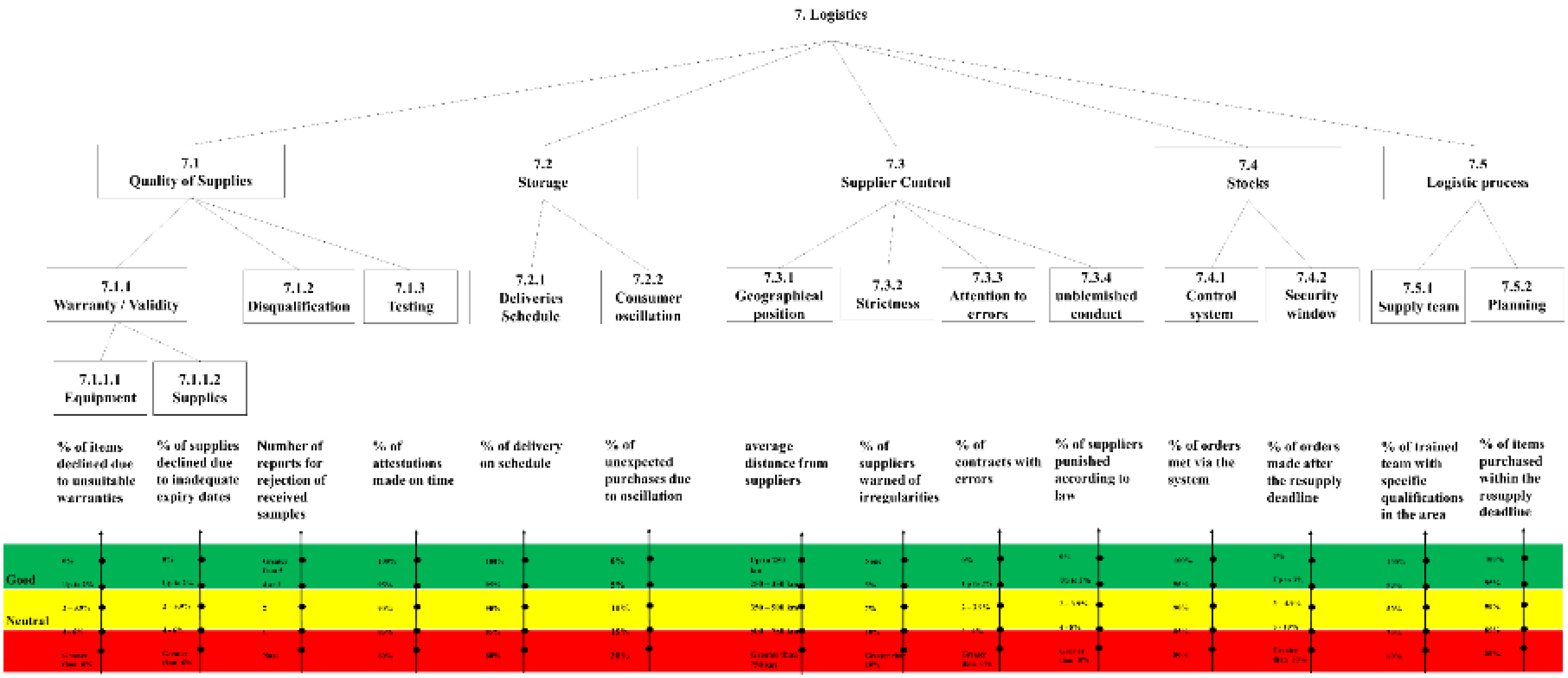
Legitimacy (objectivity, accuracy and precision) is operationalized by the observance of six properties (Keeney, 1992). These properties were verified along with the decision maker to test all the descriptors, ensuring the fulfillment of the legitimation foundation.

The validation principle, within the perspectives established by Micheli and Mari (2014), is achieved by observing the operations to be performed with the indicators and the degree of information contained in the scales as proposed by Stevens (1946). Thus, the validity of the model was met, respecting the limits for the statistical tests of the scales (Stevens, 1946).

The properties that make up the principle of legitimacy established by Keeney (1992), as well as those of the principle of validation, established by Stevens (1946), were used by the decision maker to test all the descriptors that make up the present model and thus, ensure their legitimacy and validation.

Once the model scales were defined, in order to allow the comparison between the descriptors, the decision maker set Good and Neutral levels for each. These levels establish three situations: Values above the Good level, indicate that the performance is excellent, above the expectations of the decision maker; those below the Neutral level, indicate that the performance is compromising, below the expectations of the decision maker; and between the Neutral and Good levels, indicate that the performance is equivalent to the expected (Leonardo Ensslin et al., 2001).

Figure 38 - Descriptors of FPV “Logistics”



Source: Research data

An example of the reference levels of a descriptor is shown in table 15 below, while figure 38 above shows the descriptors of area of concern 'Logistics'

Table 15 - Reference levels for the descriptor of EPV 1.1.2.1 - Collaborators

Descriptor of EPV 1.1.2.1 - % of achievement of projected number of collaborators		
REFERENCE LEVELS	**LEVELS OF IMPACT**	**ORDINAL SCALE**
	L5	100%
GOOD	L4	95%
	L3	90%
NEUTRAL	L2	85%
	L1	80%

Thus, the scales for each of the Points of View of the HSV were constructed, as exemplified for the "Logistics" FPV in Figure 5 (The descriptors of the other FPVs can be found in Appendix E). The completion of construction of the scales of the model marked the start of the evaluation phase of MCDA-C.

5.2 EVALUATION PHASE

After the structuring stage, the next step of the MCDA-C methodology is the evaluation phase of the model. The evaluation process allows the assessment and global integration of the model, and is divided into four stages: (i) construction of value functions; (ii) identification of descriptor compensation rates; (iii) development of the global evaluation; and (iv) development profile impact of the current situation *(status quo)*.

5.2.1 Construction of value functions

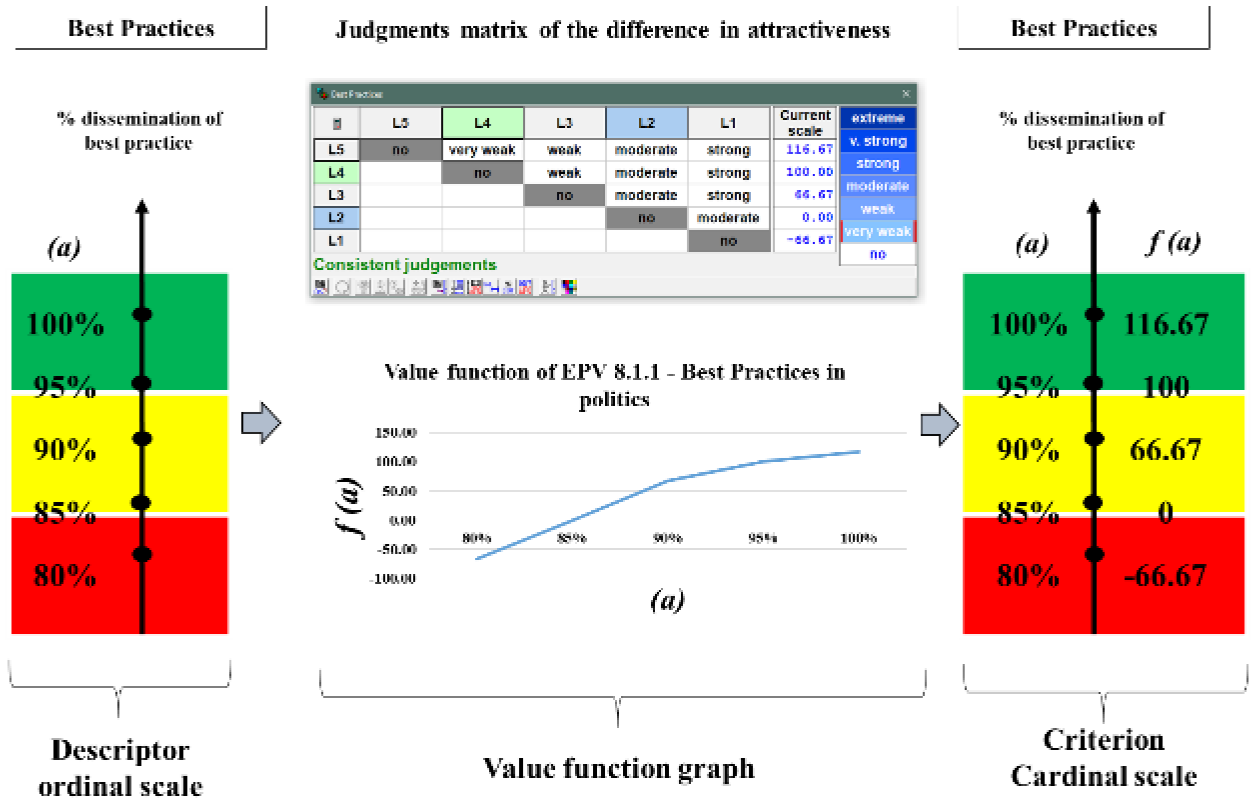
After defining the descriptors to evaluate the potential actions of each Point of View, we now quantify their performance according to the value system of the decision maker. This process stems from the need to transform the ordinal scales of the descriptors into cardinal scales. The construction of value functions is necessary since ordinal scales are not considered numerical scales, even when they consist of numbers that represent only alphanumeric symbols and thus do not belong to the set of real numbers. Thus, the MCDA-C methodology recognizes the misconception of using ordinal scales for functions involving numeric operations (Leonardo Ensslin, Giffhorn, et al., 2010). For this, one can use value functions, which are a tool that help decision makers to articulate their preferences, ordering them (differences in attractiveness) between pairs of impact levels or potential actions (Leonardo Ensslin et al., 2000).

Several methods are used to construct value functions, among them: Direct Punctuation, Bissection and Semantic Judgment. In this case study, semantic judgment is used, in which the value function is obtained, from the Measuring Attractiveness by Categorical Based Evaluation Technique (MACBETH) method, by the peer-to-peer comparison of the difference in attractiveness between potential actions (Carlos A Bana e Costa & Vansnick, 1995)

From the constructed descriptors, the decision maker was asked to verbally express the difference in attractiveness between two potential actions. As an example, in descriptor of the EPV 8.1.1 Best Practices, the decision maker was asked: "What is the difference of attractiveness between 100% dissemination of best practices (L5) and 95% dissemination (L4)? The answer to this question is based on seven categories: (i) null; (ii) very weak; (iii) weak; (iv) moderate; (v) strong; (vi) very strong and (vii) extreme. The same procedure was performed in the other levels of impact of the descriptor forming a matrix, which by the MACBETH method, determines the value function corresponding to the semantic judgments of the decision maker.

The values of 0 for the "Neutral" impact level and 100 for the "Good" impact levels were set for each descriptor. Figure 6 illustrates the value function obtained, according to the decision maker's answers, for EPV 8.1.1 - Best Practices. The value functions of the descriptors of the other FPVs can be found in Appendix F.

Figure 39 - Transforming ordinal scales into cardinal scales



Source: Research data

Figure 40 - Hierarchical Structure of Value and Scales of the “Politics” FPV

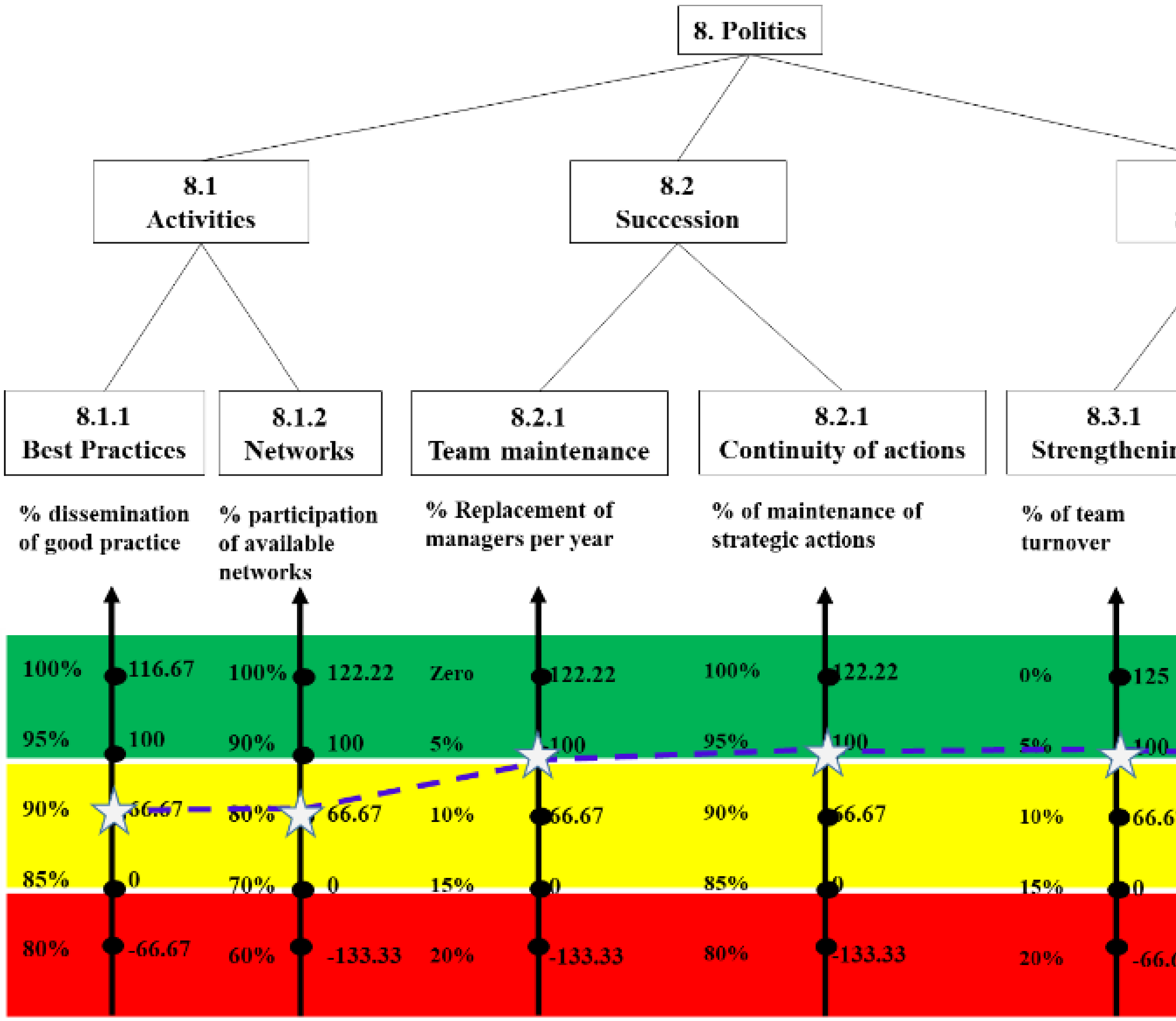


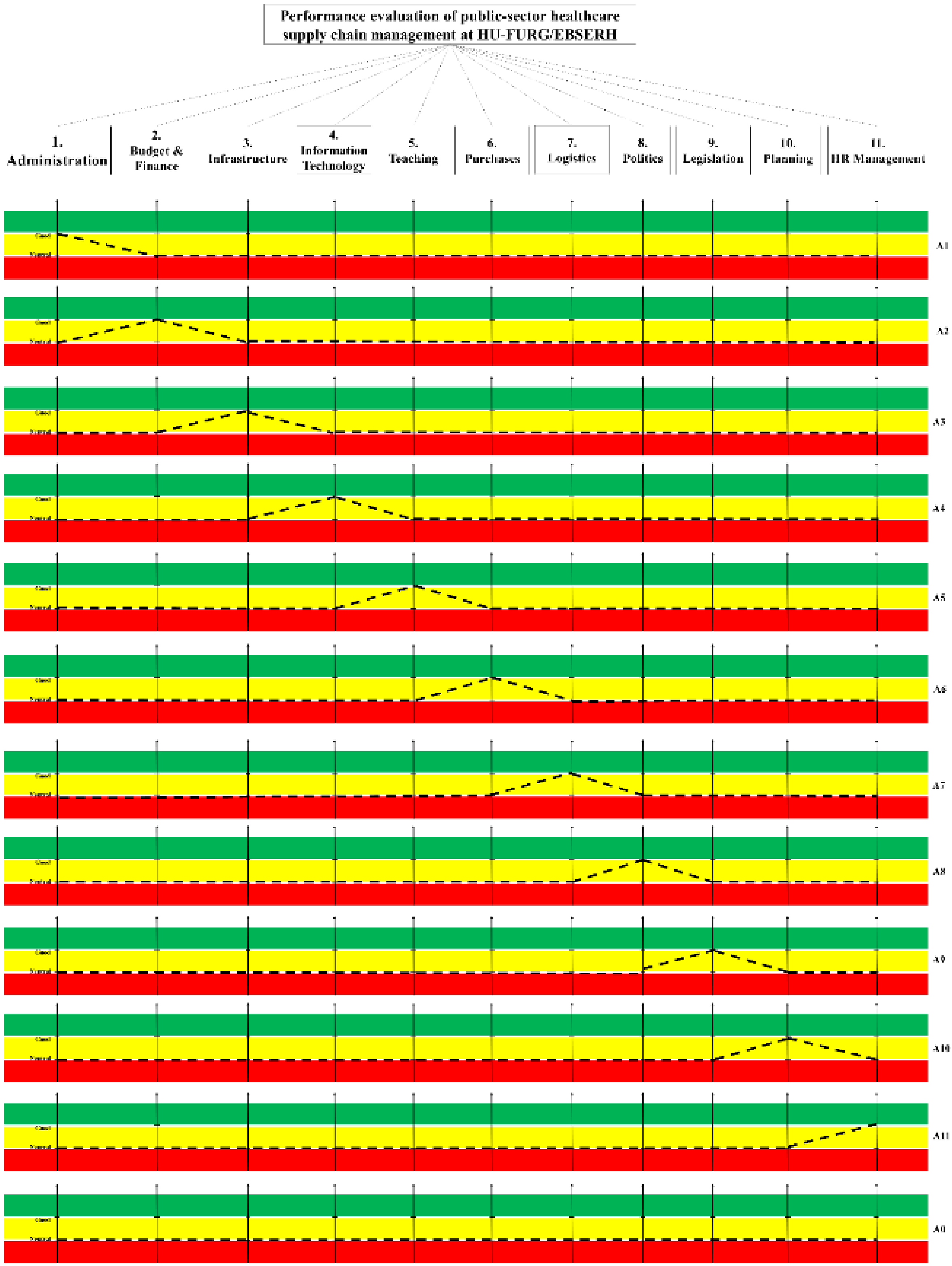
Figure 40 presents the descriptors of the "Politics" FPV with their respective ordinal and cardinal scales. The descriptors of the other FPVs along with their respective scales can be found in Appendix G.

From this point, the decision maker is able to cardinally measure every aspect he considers relevant, in an isolated form. However, in order to carry out global evaluation of the model, considering all the criteria simultaneously, it is necessary to identify the compensation rates for each EPV and FPV, this step is presented in the following section.

5.2.2 Identification of compensation rates

In order to be able to aggregate local information in order to obtain a global assessment, it is necessary to know the substitution rates associated with the criteria (Leonardo Ensslin et al., 2001), also known as compensation rates. For this, the decision maker will define the order of his preference among the existing alternatives. The process, carried out for the entire model, is exemplified in figure 41 for the eleven FPVs:

Figure 41 - Identification of alternatives



Source: Research data

In the next step, the alternatives must be ordered according to the preference of the decision maker. For this step, Roberts’ Matrix is used and the options are compared in pairs, as can be observed in Figure 42.

Figure 42 - Roberts' Matrix

	A1	A2	A3	A4										
A1		0	1											
A2	1		1											
A3	0	0												
A4	0	0	0											
A5	0	0	0											
A6	0	0	1											
[illegible]	[illegible]	[illegible]	[illegible]											

It is concluded from this matrix that the order of preferences of the alternatives for the decision maker is:

$$A2 > A11 > A1 > A6 > A7 > A3 > A4 > A5 > A10 > A8 > A9 > A0 >$$

From this information we have the ordinal scale of the alternatives. To convert them into a cardinal scale, the M-Macbeth software is again used and, by means of semantic judgment, it is possible to construct the compensation rates.

Figure 43 - Global Compensation rates

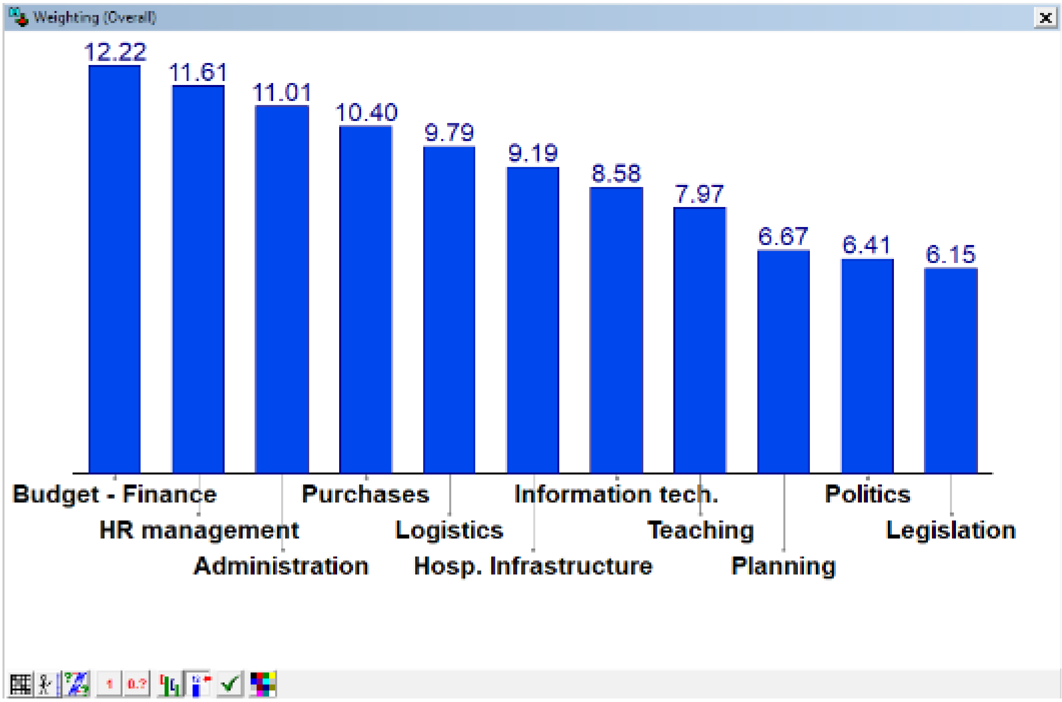


Figure 44 - Compensation Rates of all FPVs

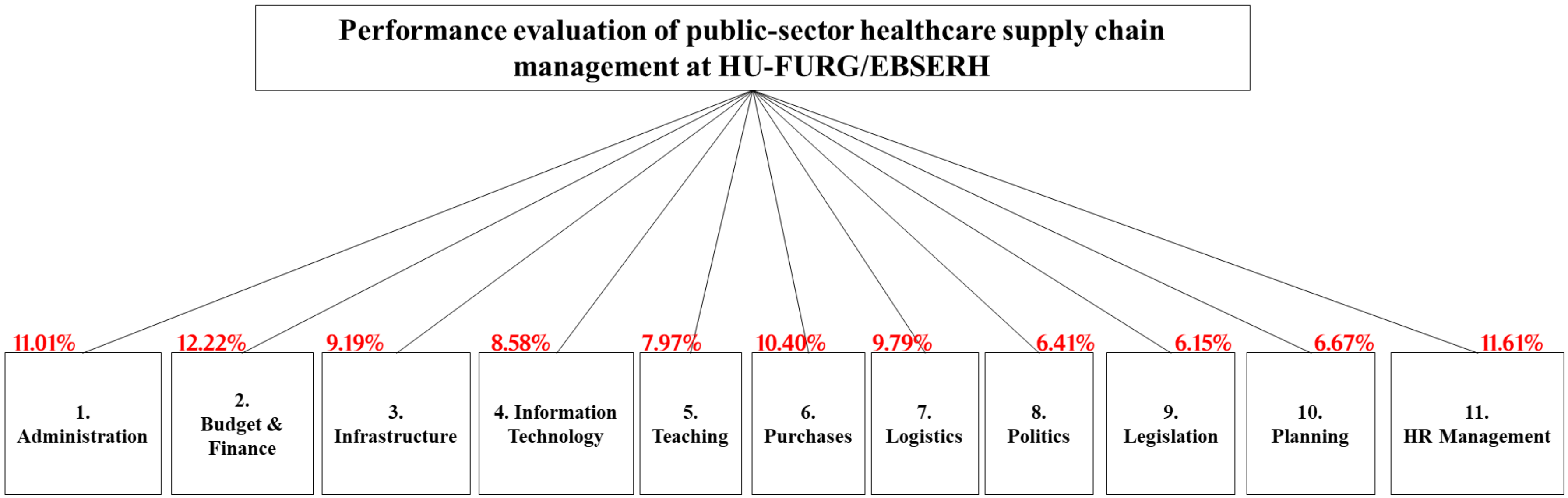
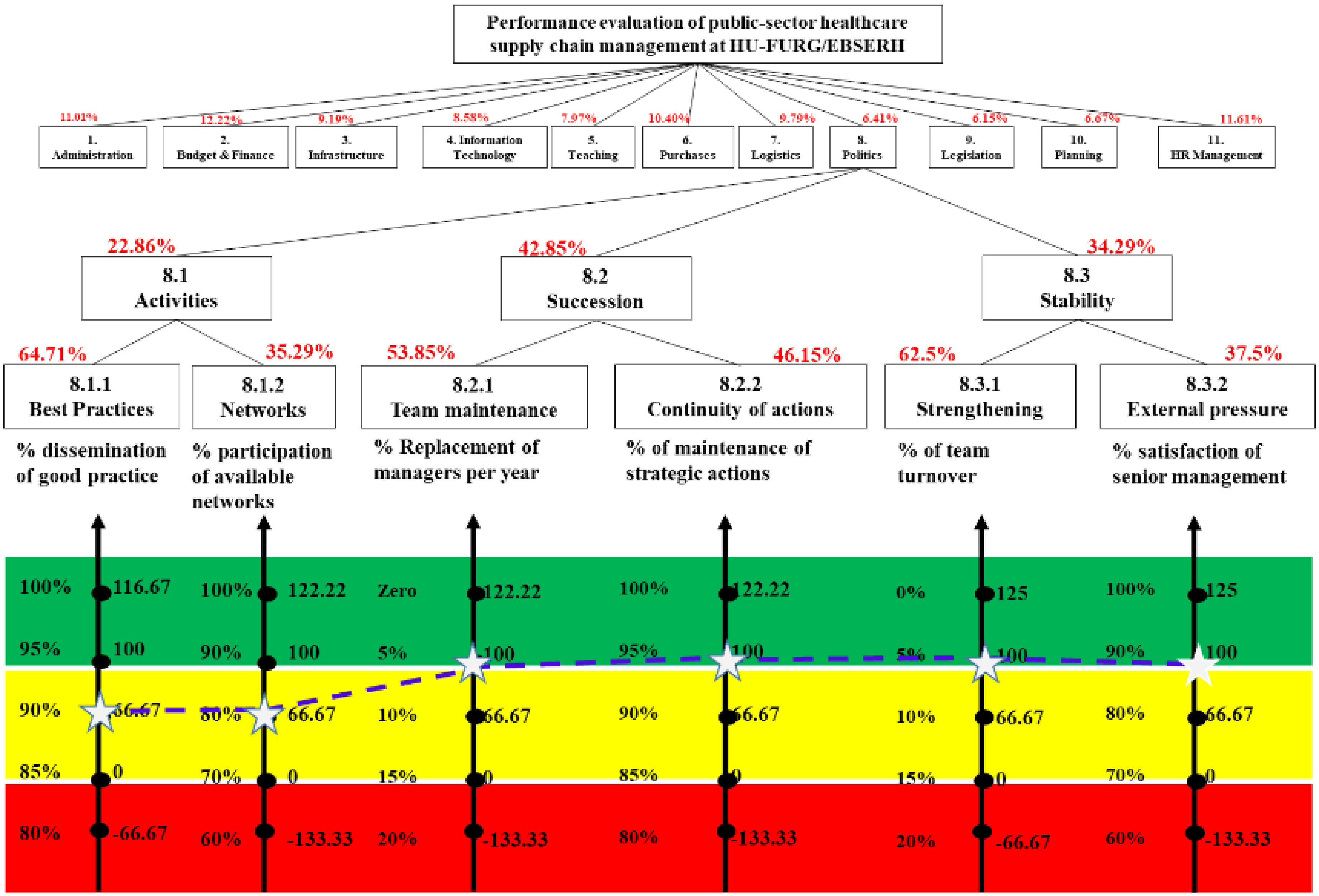


Figure 45 - FPV “Politics” with its compensation rates and *status quo*



Performance evaluation of public-sector healthcare supply chain management at HU-FURG/EBSERH
11.01%
1. Administration
12.22%
2. Budget & Finance
9.19%
3. Infrastructure
8.58%
4. Information Technology
7.97%
5. Teaching
10.40%
6. Purchases
9.79%
7. Logistics
6.41%
8. Politics
6.15%
9. Legislation
6.67%
10. Planning
11.61%
11. HR Management
22.86%
8.1 Activities
42.85%
8.2 Succession
34.29%
8.3 Stability
64.71%
8.1.1 Best Practices
35.29%
8.1.2 Networks
53.85%
8.2.1 Team maintenance
46.15%
8.2.2 Continuity of actions
62.5%
8.3.1 Strengthening
37.5%
8.3.2 External pressure
% dissemination of good practice
% participation of available networks
% Replacement of managers per year
% of maintenance of strategic actions
% of team turnover
% satisfaction of senior management
100% 116.67
95% 100
90% 66.67
85% 0
80% -66.67
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Zero 122.22
5% 100
10% 66.67
15% 0
20% -133.33
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
0% 125
5% 100
10% 66.67
15% 0
20% -66.67
100% 125
90% 100
80% 66.67
70% 0
60% -133.33

The procedure shown in figures 43, 44 and 45 was repeated for the entire model. Appendix G presents the Hierarchical Structure of Value with the ordinal and cardinal scales and compensation rates for the entire model.

5.2.3 Identification of the impact profile of the alternatives and global evaluation of the model

The last step of the evaluation phase concerns the global assessment of the model and the *status quo* impact profile. With compensation rates determined, local assessments of each action was aggregated into a single global evaluation. For this purpose, the additive aggregation formula is used (Carlos A Bana e Costa, 1993).

The formula for calculating the overall performance of the model is:

$$V_{PE\_HU}(a) = 0.1101 \times V_{FPV1}(a) + 0.1222 \times V_{FPV2}(a) + 0.0919 \times V_{FPV3}(a) + 0.0858 \times V_{FPV4}(a) + 0.0797 \times V_{FPV5}(a) + 0.1040 \times V_{FPV6}(a) + 0.0979 \times V_{FPV7}(a) + 0.0641 * V_{FPV8}(a) + 0.0615 \times V_{FPV9}(a) + 0.0667 \times V_{FPV10}(a) + 0.1161 \times V_{FPV11}(a)$$

In this equation, *V (a)* corresponds to the global score of the performance evaluation model for the SCM of HU-FURG/EBSERH and (a) refers to the evaluation of the criteria linked to each FPV. For the calculation process of the FPVs, the following equation is used, as exemplified by the calculation of the “Politics” FPV:

$$V_{FPV8}(a) = 0.2286 \times V_{Activities}(a) + 0.4285 \times V_{Succession}(a) + 0.3429 \times V_{Stability}(a)$$

Where:

$$V_{Activities}(a) = 0.6471 \times V_{BestPractices}(a) + 0.3521 \times V_{Networks}(a)$$
$$V_{Succession}(a) = 0.5385 \times V_{TeamMaintenance}(a) + 0.4615 \times V_{ContinuityOfActions}(a)$$
$$V_{Stability}(a) = 0.6250 \times V_{Strengthening}(a) + 0.3750 \times V_{ExternalPressure}(a)$$

Therefore:

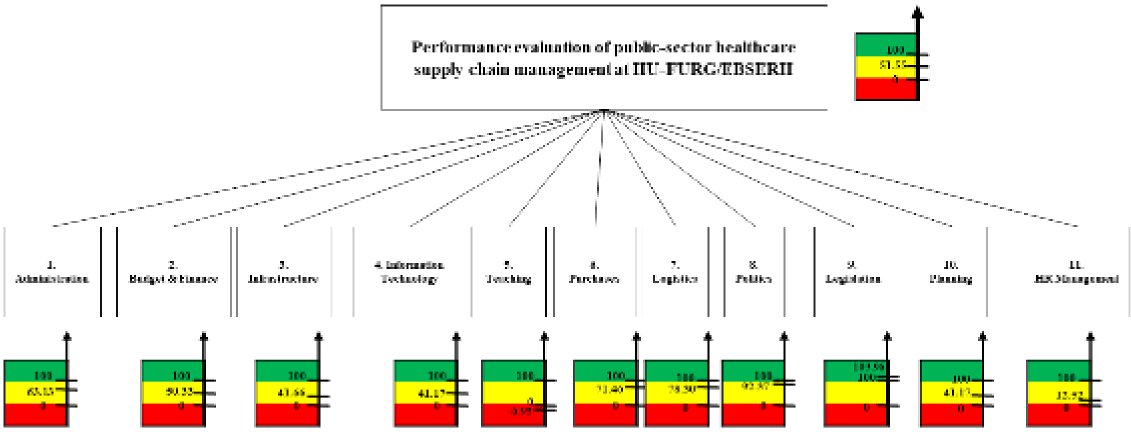
$$V_{FPV8}(a) = 0.2286 \times 66.62 + 0.4285 \times 100 + 0.3429 \times 100$$

$$V_{FPV8}(a) = 92.37$$

With compensation rates determined, it was necessary to identify, along with the decision maker, the *status quo* of the evaluated criteria. Based on this identification, it is possible to get a picture of which elements of the model present opportunities for improvement, directing the strategic actions to increase the performance of the context.

As a result of the construction of the compensation rates and the application of the additive aggregation formula in the model, the total value of 51.55 points was obtained. Figure 46 shows the scores obtained for all the FPVs of the model. The detailed result of the performance of each descriptor is presented in the Table below and the global assessment of the SCM of HU-FURG/EBSERH is presented in Appendix M. (The *status quo* of other FPVs and the application of the aggregation formula are given in the Appendix.)

Figure 46 - Impact profile of the Status quo in the model FPVs



As demonstrated by Figure 46, the 'Legislation' FPV presented the highest score (103.96), thus representing an area with a significant contribution to the global assessment. This result can point out an area in which the decision maker is content with the current performance. The lowest score of -6.93 in the teaching area of concern indicates the fact that the decision maker has less control over the aspects that involve it, which makes it difficult to control and adopt corrective actions when necessary, when compared to the aspects of the other FPVs of the model. The other areas of concern such as Human Resources Management point to areas where the decision maker encounters more management difficulties, mainly due to the fact that he has little or no control over the analyzed aspects and his performance is conditioned to external events, such as approval from the federal government to hire more professionals or depends on staff from areas out of his reach.

After performing the global evaluation, the sensitivity of the constructed model was tested to verify its robustness. After being considered stable, it was possible to conclude the Evaluation Phase of the model. Thus, the knowledge of compensation rates and the model score allowed the manager to have a broad view of his management process, identifying the criteria in which SCM presents a compromising level and that need to be improved to reach higher levels of performance. This holistic view also allows the manager to know the impact of his management on the criteria he considers essential. After an analysis of the global evaluation, it is noted that the area that currently compromises the supply chain management of HU-FURG/EBSERH most is ‘Teaching’. In this case, a negative score is clearly a concern factor for the decision maker, since the area contributes to the overall evaluation by 7.97%, thus improvement actions are indicated. Another point of concern is the Human resources management, which presented a score of 12.52 in the evaluation and is almost at a compromising level. Being one of the areas that most contributes to the global model (11.61%), it requires special attention of the decision maker. In this case, in addition to recommending improvements in the criteria at a compromising level, it is suggested to pay attention to those criteria that, even though not at the compromising level, can be improved at a low cost. This can be extended to the other most influential areas of concern according to the decision maker: Administration (11.01%), Budget and Finance (12.22%), Purchases (10.40%) and Logistics (9.79%).

After completing the Evaluation Phase of the model, the next step is to propose improvement actions that comprise the last phase of the model.

5.3 RECOMMENDATIONS PHASE

The third and final phase of the MCDA-C, known as the recommendations phase, aims to aid the decision maker in leveraging the constructed model, through suggestions for each of the descriptor identified with compromising performance in the decision evaluation context, that is, from the determination of the impact profile of the current situation. It is important to emphasize that the MCDA-C recommendations phase does not aim to prescribe actions, but to aid the decision maker in identifying the points that need improvement, in the elaboration of improvement actions and in the evaluation of its consequences (R. C. Azevedo et al., 2011; Leonardo Ensslin, Ademar Dutra, et al., 2017; A. A. Longaray et al., 2015). The recommendations phase is divided in Sensitivity analysis and Formulation of recommendations.

5.3.1 **Sensitivity analysis**

Sensitivity analysis consists of verifying that the final model result of the alternatives varies by changing the parameter values, i.e. it allows to know if a change in a parameter, such as the compensation rates, will cause a great variation in the evaluation of potential actions (Leonardo Ensslin et al., 2001). In the present research, the sensitivity analysis will be carried out on compensation rates.

To demonstrate how the sensitivity analysis equation is obtained, we consider that the sum of the compensation rates is equal to 1, thus we have:

$$\sum_{1}^{n} w_1 = 1$$

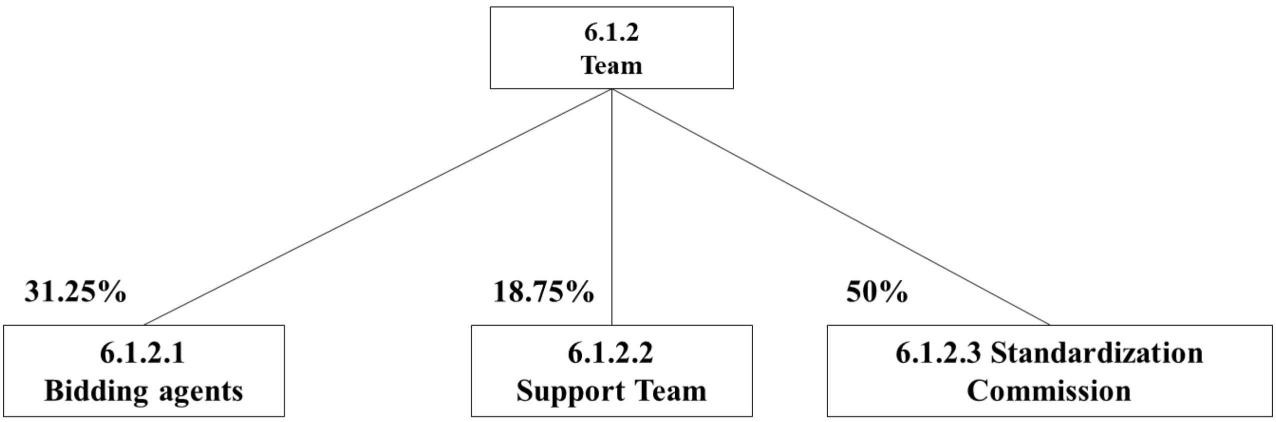
And that all the compensation rates range from 0 to 1, we have:

$$1 > w_i > 0 \forall\ i$$

Where w_i is the compensation rate of criterion i.

To illustrate how a change in a compensation rate can change the other compensation rates, we will use the EPV 6.1.1 Team, of the Purchases area of concern, which has three criteria, as shown in the Figure below.

Figure 47 - Sensitivity analysis of compensation rates for EPV 6.1.2 - Team



Source: Research Data

Since:

$$w_1 + w_2 + w_3 = 1 \qquad \text{Equation 1}$$

Rewriting equation 1, we have:

$$w_2 + w_3 = 1 - w_1$$

Knowing that $w_1 = 0.3125$,

$$1 - w_1 = 1 - 0.3125 = 0.6875$$

According to Ensslin et al. 2001, the compensation rate is changed by ±10%, thus we suppose that the decision maker decides to change the compensation rate of $w_1 = 0.3125$ to $w_1^{'} = 0.28125$ and $w_1^{''} = 0.34375$. As a result, the other compensation rates will also change, having values of $w_2^{'}$ and $w_3^{'}$ and $w_2^{''}$ and $w_3^{''}$.

Thus we have :

$$\mathrm{w}_1^{'} + \mathrm{w}_2^{'} + \mathrm{w}_3^{'}$$
$$\mathrm{w}_2^{'} + \mathrm{w}_3^{'} = 1 - \mathrm{w}_1^{'}$$
$$\mathrm{w}_2^{'} + \mathrm{w}_3^{'} = 1 - 0.28125 = 0.71875$$

To calculate $w_2^{'}$ and $w_3^{'}$ without changing the ratio that existed between the compensation rates of w_1, w_2 and w_3, we have:

$$\frac{w_2}{w_3} = \frac{w_2^{'}}{w_3^{'}}$$

and since:

$$w_2 + w_3 = 1 - w_1$$

$$\therefore \quad \frac{w_2}{1-w_1} + \frac{w_2}{1-w_1} = \frac{1-w_1}{1-w_1} = 1$$

and

$$w_2^{'} + w_3^{'} = 1 - w_1^{'}$$
$$\therefore \quad \frac{w_2^{1}}{1-w_1^{'}} + \frac{w_3^{'}}{1-w_1^{'}} = 1$$

Thus, to ensure the ratio, we have:

$$\frac{w_2}{1-w_1} = \frac{w_2^{'}}{1-w_1^{'}} \quad \therefore \; w_2^{'} = \frac{w_2\left(1-w_1^{'}\right)}{1-w_1} = \frac{0.1875(1-0.28125)}{1-0.3125} = 0.1960$$

$$\frac{w_2}{1-w_1} = \frac{w_2^{''}}{1-w_1^{''}} \ \therefore \ w_2^{''} = \frac{w_2\left(1-w_1^{''}\right)}{1-w_1} = \frac{0.1875(1-0.34375)}{1-0.3125} = 0.1787$$

and:

$$\frac{w_3}{1-w_1} = \frac{w_3^{'}}{1-w_1^{'}} \ \therefore \ w_3^{'} = \frac{w_3\left(1-w_1^{'}\right)}{1-w_1} = \frac{0.5(1-0.28125)}{1-0.3125} = 0.5227$$

$$\frac{w_3}{1-w_1} = \frac{w_3^{''}}{1-w_1^{''}} \ \therefore \ w_3^{''} = \frac{w_3\left(1-w_1^{''}\right)}{1-w_1} = \frac{0.5(1-0.34375)}{1-0.3125} = 0.4773$$

Thus, the general formula for calculating the new compensation rates $w_n^{'}$ is:

$$w_n^{'} = \frac{w_n\left(1-w_1^{'}\right)}{1-w_1}$$

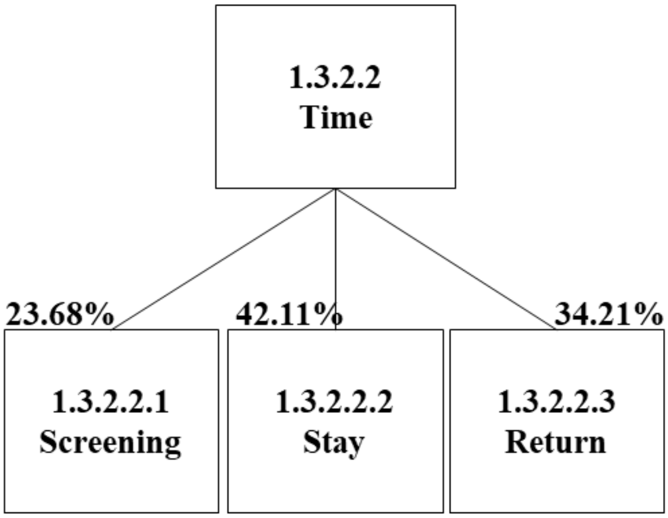
Where $w_1, w_2, w_3, \ldots\ldots, w_n$ are the original criteria compensation rates and $w_1^{'}, w_2^{'}, w_3^{'}, \ldots\ldots, w_n^{'}$ are the modified criteria compensation rates.

Having established this understanding, the sensitivity analysis of the compensation rates was performed, as exemplified in the table below.

Table 16 - Sensitivity analysis of EPV 6.1.2 Team

Action	Original Evaluation		Evaluation -10%		Evaluation +10%	
	w_1=31.25%		$w_1^{'}$ = 28.125%		$w_1^{''}$ = 34.375%	
	Global Evaluation	Order	Global Evaluation	Order	Global Evaluation	Order
6.1.2.1 Bidding Agents	39.0625	1	35.1625	1	42.9688	1
6.1.2.2 Support Team	12.5006	2	13.0673	2	11.9139	2
6.1.2.3 Standardization Commission	0	3	0	3	0	3

Figure 48 - Sensitivity analysis of compensation rates for EPV 1.3.2.2 - Time



Source: Research Data

Table 17 - Sensitivity analysis of EPV 1.3.2.2 Time

Action	**Original Evaluation**		**Evaluation -10%**		**Evaluation +10%**	
	w_1=23.68%		**w_1' = 21.312%**		**w_1'' = 26.048%**	
	Global Evaluation	**Order**	**Global Evaluation**	**Order**	**Global Evaluation**	**Order**
1.3.2.2.1 Screening	15.7875	2	14.2087	2	17.3675	2
1.3.2.2.2 Stay	-50.5320	3	-52.1040	3	-48.9601	3
1.3.2.2.3 Return	17.1050	1	16.5750	1	17.6350	1

Source: (Bastos, 2018)

According to Ensslin et al. (2001), a module is considered robust when the first three positions remain unchanged. Thus, by analyzing the tables above, it can be seen that both the increase and decrease by 10% in the compensation rates of the EPVs ‘Team’ and ‘Time’ did not generate expressive changes in the overall evaluation, since the order of preference of actions remain constant. Sensitivity analysis was performed for the other criteria, and the results confirmed that the model shows little sensitivity to changes in compensation rates, confirming the robustness of the developed model.

5.3.2 **Formulation of recommendations.**

From the identification of the *status quo* of the model, the criteria that need improvement are analyzed, i.e., the descriptors that presented performance at a compromising level. It is observed that 21 descriptors presented compromising level of performance.

A detailed analysis of these descriptors was carried out in order to identify their influence on the overall evaluation of the model, as observed in the table below.

Table 18 - Descriptors with performance at a compromising level

EPV	Descriptor	Contribution to FPV	Contribution to Global Performance
1.1.2.1 Collaborators	% achievement of projected quantity	2.5424%	0.0028%
1.3.2.2.2 Stay	Average of stay (length min)	1.4953%	0.0016%
1.4.1 Specialties	% of new specialties covered by professionals	7.8938%	0.0087%
11.2.1.1.1 Vacancies	% of vacancies filled	2.9832%	0.0035%
11.2.1.3 Sizing	% occupation of the sizing vacancies	6.1015%	0.0067%
11.3.1 Harmony	Number of interventions/yr of the service of the organizational psychologist	6.8599%	0.0076%
11.4.3 Mapping	% of mapped functions	8.5850%	0.0095%
6.3.5.1 Sample valuation	mean evaluation time (days)	2.4341%	0.0025%
6.3.7.2.2 National	% of items ordered in the national market	0.0074%	0.0008%

EPV	Descriptor	Contribution to FPV	Contribution to Global Performance
4.1.1.2 Response Time	Response Time in minutes	4.4100%	0.0034%
4.2.1.2.1 Users	% of users trained	0.0074%	0.0006%
4.2.2.1 Costs	% of implemented cost program	4.9995%	0.0043%
4.3.1 Integration	% of integrated systems	9.1491%	0.0079%
3.1.1 Faults Identification Policy	% structuring of the Fault Identification Policy	7.06%	0.0065%
3.2.4 Space Modernization	% of modernized environments	6.6675%	0.0061%
3.3.1.1 Related areas	% of related areas grouped	3.1570%	0.0029%
3.3.1.2 Mapping	% mapped structure	5.6141%	0.0052%
2.2.3 Operational Security	% of mapped processes deployed and validated	15.1485%	1.8360%
5.2.2 Professors	% of trained preceptors	7.245%	0.0058%
5.3.2 Management Training	% of participation in meetings and training on hospital management	10.78%	0.0086%
5.3.3 SUS	Number of training/year on SUS practices	5.88%	0.0047%

Source: Research data

From the analysis of Table 18, improvement actions were elaborated for each descriptor, through goals and action plans. Tables 19 and 20 present the proposed action plan for EPV 4.3.1 Integration and 11.3.1 Harmony, while the others are presented in Appendix H.

Table 19 - Proposed action plan for EPV 4.3.1 Integration

Critical performance factor to be improved:	EPV 4.3.1 Integration
Descriptor:	% of integrated systems
Proposed Actions:	- Create a multidisciplinary working group(WG) to map all candidate Integration processes; - Establish a schedule for the working group findings and final report; - Request the IT sector to support the WG; - Implement the integration of all the organization processes in the system; - Test all the processes before launch; - To encourage the staff to actively participate in the system tests;
Responsible:	Head of the IT Sector
Deadline:	1st semester of 2020
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	General Manager
Expected result:	Change from '<80% Integration of systems' to '80% Integration of systems'
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

Table 20 - proposed action plan for EPV 11.3.1 Harmony

Critical performance factor to be improved:	11.3.1 Harmony
Descriptor:	Number of interventions/yr of the service of the organizational psychologist
Proposed Actions:	– Create a task force to develop strategies for conflict resolution; – Identify behavioral tendencies that seem to trigger certain attitudes, provoke mindset shifts, or

	demonstrate a lack of self-awareness; – Have a set of established ground rules to keep everyone safe; – Identify conflict boundaries to establish standards that will help prevent conflict from arising;
Responsible:	Chief Organizational Psychologist
Deadline:	Second semester de 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	DivGP
Expected result:	Change from ‘More than 8 interventions’ to ‘Less than 2 interventions’
Descriptor Impact:	Improving from N1 (-133.33) to N4 (100)

Based on the implementation of the proposed improvement actions, the performance of the supply chain management of HU-FURG/EBSERH is expected to increase. If the proposals are successfully implemented, they will result in an increase of 24.7 points, raising the model score from 51.55 to 76.25 points. Looking at the areas of concern individually, especially at the Budget and Finance FPV, which contributes the most to the global score, improvement actions on a single EPV, ‘2.2.3 Operational Security’, may impact the entire model by almost 2%, a total of 30.30 points on this FPV alone and 3.67 points on the global score), presenting a higher improvement potential of the model when compared to the other FPVs that compose the model. Another EPV, 2.2.1 Transparency, in the same area of concern may positively impact the global performance (1%) of the model if the action is improved from Level 2 (Neutral) to Level 4 (good), by adding 8.27 points to the FPV.

After the improvement actions have been implemented, the monitoring of the impact on the respective performance indicators and on the overall evaluation of the model should be carried out continuously, updating the performance of each one indicated. Based on the improvements that are being achieved, it is necessary to change the target for each indicator, thus establishing a management process with continuous evaluation cycles and focused on results.

5.3.3 Comparison with the indicators proposed in literature

The construction of the HU-FURG/EBSERH Supply Chain Management Performance evaluation model was based on the values, beliefs and world view of the General manager, responsible for making all decisions related to all activities related to the health care supply chain. Thus, the indicators that make up the model herein are specific to the context and, therefore, legitimized for the decision-making context.

During the analysis of the Bibliographic Portfolio formed for the theoretical framework of the model, some indicators already applied in the international context were highlighted, however, although some indicators are very similar to those of the model presented in this research, none of them are exactly analogous to the SCM of HU-FURG/EBSERH.

The table below shows indicators from the model constructed in the present study that were similar to those found in literature. It is observed that the rest of the indicators found in the present study were characteristic to the ad hoc model constructed and were thus not found in literature.

Table 21 - Comparison of the model indicators with those found in literature

Indicator in present study	Indicator in literature	Authors
Screening/stay	no delay in treatment	Supeekit et al. (2016)
Installed capacity	overcrowding	Supeekit et al. (2016)
Mapping costs	total cost per patient	Supeekit et al. (2016)
screening	total waiting time of patient	Supeekit et al. (2016)
stay	patient throughput or turnaround time	Supeekit et al. (2016)
Access time and distance	Accessibility to services	Supeekit et al. (2016)
Mapping costs	cost of inventory	Supeekit et al. (2016)
Ideal Quantity	obsolete stock cost / overstocking cost	Supeekit et al. (2016)
Standardization Commission	Standardization	F. Lega et al.(2012)
	Staff specialization	F. Lega et al.(2012)
	Safety	F. Lega et al.(2012)
Investment in IT	Technological Investment	F. Lega et al.(2012)
Supplier satisfaction	Supplier relationship management	F. Lega et al.(2012)
Information flow	accessibility and flow of information	A. Longaray et al. (2018)
Integration of systems	computerization of stock control systems	A. Longaray et al. (2018)
Suppliers with Best Practice Certification	Suppliers' capabilities	Bakar et al. (2009)
Suppliers with Best Practice	Supplier evaluation	Kumar et al. (2006)

Certification		
Resolutivity	Solvability rate	Kumar et al. (2006)
	Efficiency of IT system	Kumar et al. (2006)
Effectiveness of Terminals	Effectiveness of IT system	Kumar et al. (2006)
Trained users	Training utilization rate	Kumar et al. (2006)

With the analysis of the indicators presented in the literature, it is noticed that some of them present the same idea of those constructed for the supply chain management of the HU-FURG / EBSERH, but differ on what is to be measured or the scales to be used. On the scales used, what is noticed is that those extracted from BP present only one statement /objective, but not necessarily the direction of preference. These divergences are completely acceptable, since the constructivist approach of the MCDA-C methodology assumes that the model is customized and unique to the application context in which the health care institution is inserted, and its construction considers the specificities and characteristics of the institution and the decision maker's perception.

6 CONCLUSION

The argument for greater efficiency in the public sector at a time of spending reductions and increased pressure on services is obvious, but the importance of efficiency goes beyond saving money. The growing demand for improvement in public services means that governments, and hence public administration, respond in an efficient and quality way to these challenges. Although public administration has evolved over the years in response to the challenges posed by a society increasingly conscious and concerned about the public service, mainly due to reforms in the public administration that were based on practices used in the private sector, seen with greater intensity from the 1980s.

Faced with this new trend, there has been a prominent use of performance evaluation tools as an instrument to aid in the public sector management. The adoption of commonly used private sector management practices aims to increase efficiency and improve quality in public services. Accordingly, this research seeks to contribute in the improvement of public administration management.

Furthermore, within the scope of public administration, management of the supply chain is a sensitive and determining function for efficient management of public services, considering that it is the combination of all parties (e.g. external suppliers, partner organizations, internal services units) both inside and outside the organization, involved in delivering the inputs, outputs or outcomes that will meet a specified public sector requirement. The importance of this endeavor was one of the motivations of the present research and selection of a case study in the public organization.

The other driving force is the fact the PROFIAP Graduate program is intended to train professionals with a clear understanding of the role of the State in Brazil, the exercise of citizenship and concern for the ethical, social and environmental issues that will subsidize the public policies that impact society. In this context, this professional will meet the scientific and technical conditions to promote improvements in public management. The main objectives are: 1) To enable professionals to exercise advanced administrative practice in public organizations; 2) Contribute to increase the productivity and effectiveness of public organizations; and 3) Provide instruments, models and methodologies that serve as reference for the improvement of public management.

Therefore, this study perfectly reaches the intended objectives, since it aimed to contribute empirically to the improvement of public administration through the proposal of a performance evaluation model of the SCM process of a federal public organization.

The purpose of this research was to answer the following question: “How can a constructivist performance evaluation model that supports the supply chain management of a public hospital can be operationalized?” Due to the complexity of the subject studied and the multiple management aspects involved in the public-sector SCM process, the MCDA-C methodology was employed as a methodology to guide the construction of the performance evaluation model.

Within the MCDA-C methodology, the present research begun in the Structuring Phase, which consisted of a series of interviews with the decision maker with the objective of collecting the primary evaluation elements (PEEs). Thus, 98 PEEs were identified together with the decision maker, which then led to the construction of 228 concepts, later used for the design of cognitive maps. Once the cognitive maps were designed, it was possible to identify and define the Fundamental Points of View (FPV), as well as to expand and decompose the FPVs into Elementary Points of View (EPV). In this stage, eleven FPVs were defined: “Administration”, “Budget-Finance”, “Hospital Infrastructure”, “Information Technology”, “Teaching”, “Purchases”, “Logistics”, “Politics”, “Legislation”, “Planning”, and “Human Resources Management”.

After the definition of the FPVs and EPVs, it was possible to create the descriptors, the evaluation criteria used in the management process. Thus, at the end 160 descriptors were defined for the performance evaluation model. It is important to note that the work of defining this structure of points of view, called Hierarchical Structure of Value, was carried out together with the decision maker who contributed his opinions, perspectives and objectives.

The evaluation phase followed next, with the conversion of the ordinal descriptor scales into cardinal scales being performed first. Then, the compensation rates between the points of view were calculated. Finally, an equation was defined for each of the Fundamental Points of View, as well as, for the global performance of the evaluation model.

Once the performance evaluation model was defined, the recommendations stage followed next, with the analysis of sensitivity to test the robustness of the constructed model and the formulation of recommendations for improvement of the process under analysis. At this stage, the decision maker is aware of criteria with compromising performance as well as actions that can be taken to change these. The main criteria capable of generating the greatest positive impact on the SCM process were also highlighted. In the present work, management criteria with greater impact potential were identified and a set of recommendations that, if implemented, have the potential to improve management performance by 47.92%, from the global value of 51.55 to 76.25.

Furthermore it was observed that specific areas: Teaching, Human Resources Management, Planning, Information Technology and Hospital infrastructure need extra managerial efforts to improve criteria in these areas of concern due to the low scores obtained. On the other hand, extra efforts need not be directed to the others areas, Legislation for example, which had good performance.

It is important to emphasize that the improvement actions and other recommendations do not end here, with the present work. Based on the performance evaluation model developed, the decision maker can analyze each of their actions and verify their impact on the performance of the entire process. Moreover, the knowledge generated within the decision maker, not only by the use of the performance evaluation model, but also by the process of construction of the same in its different stages, will allow more effective managerial actions by the decision maker in the search for improved performance in the SCM process.

As such, the objectives of this research were reached, since a constructivist model of SCM performance evaluation applied to a public health care institution was constructed and operationalized. With the work accomplished it was possible to build a better understanding about the managerial problem and, with this, it was possible to identify, understand and measure the factors that influence the performance of the supply chain management process. This was possible through a revision of current literature on SCM applied to the public sector health care, thus meeting the first specific objective. Through a review of concepts and applications of multi-criteria methods in health care sector, and identification and measure of the necessary and sufficient criteria to evaluate the performance of public management of the HU-FURG/EBSERH supply chain, thus satisfying the second and third specific objectives.

In addition, with the definition of the descriptors and the global equation of the model, the final specific objective of this research was reached, since it was possible to carry out the structuring of the information obtained from the decision maker in order to highlight the performance evaluation criteria that influenced the management of the SCM process. Furthermore, the *status quo* was identified, and the final value obtained in the global equation of the model was 51.55 points. This reference value situates the current management of the supply chain process, and any change in management will positively or negatively reflect this value. Therefore, actions that will improve the performance of the supply chain management process will increase the current value, and vice versa.

Consequently, the main differential of the MCDA-C methodology in relation to other traditional MCDA methodologies was highlighted. MCDA-C is concerned with generating the knowledge within the decision maker, broadening their perception of the decision-making context and to the problem studied. In addition, the constructivist approach herein, is concerned with taking into account the perceptions, beliefs, opinions and goals of the decision maker within the decision-making context. The participation of the decision-maker occurs in all model construction stages, however, it is in the Structuring and Evaluation stages that their participation in the model gets clearer, not only aggregating their perceptions, beliefs and opinions to the model being developed, but also through knowledge acquired by structuring the data collected during the Structuring and Evaluation stage.

Performance measures should be relevant and authentic to facilitate the understanding of the factors that influence the performance. By using the opinions, beliefs, desires and specific objectives of the decision maker, the authenticity and relevance of the constructed model is confirmed.

According to (Epstein & Roy, 2001), a more careful understanding of both the drivers of performance and the impacts of that performance on the various corporate stakeholders permits better integration of that information into the day-to-day operational decisions and the institutionalization of concerns throughout the organization. Therefore, it is important to identify the key factors for an organization's success, thus establishing the key indicators for monitoring the performance of the organization. In the case study presented, eleven essential factors for management were identified according to the decision maker. After this identification, 160 criteria or indicators were established to carry out the performance evaluation. It is important to emphasize that these 160 key indicators or criteria were identified and constructed from the manager's view, hence the legitimacy of such criteria to be used in the supply chain management of the HU-FURG/EBSERH.

Parmenter (2015) affirms that performance indicators should be properly selected for the operation of the company, as well as for the collaborators. They should be easy to develop and adjust, and must be quickly implemented and, furthermore, they must be easily understood and, finally, should facilitate improvements. Developing of a quality indicator is a prerequisite for the utilization of the measurement system in management. There should be an organization-wide understanding of the vital KPIs. This highlights the importance of the Structuring Phase of the MCDA-C methodology. In this phase, the main objective is the organization of all the information of the decision makers in relation to the studied process, from where, a structure is defined (Hierarchical Structure of Value) in different levels that contemplate criteria or performance indicators. In other words, the Structuring stage organizes the information obtained from the decision maker in order to elaborate and select performance indicators capable of facilitating improvements in the procurement process, as defined by (Parmenter, 2015).

Furthermore, and in relation to the performance indicators, it is important to point out that though the performance indicators in the case study selected had some similarity to those found in the BP, the same differed in the fact that they were more than literal statements or objectives, since they brought along scales and objectives for intended measurements. In addition, many studies obtained their indicators from available literature or questionnaires and only one study involved the decision maker directly. On the other hand, the HU-FURG/EBSERH case study took into account all the specificities of the process (whole supply chain management) and organization, in addition, the opinions, objectives and beliefs of the manager involved were also used.

In this sense, it is possible to understand the amplitude and specificity of the performance evaluation model constructed through the 160 descriptors established, besides the different compensation rates between the descriptors in order to allow the structuring of all these criteria within a model of evaluation of unique performance and specific to the reality of that environment studied, as well as, for that manager involved.

In conclusion, the MCDA-C methodology was able to capture several aspects of the SCM process, define criteria, measure them and integrate the various indicators into a global model in order to generate knowledge within the decision maker so that he or she can better manage the process (L. Ensslin, S. R. Ensslin, et al., 2013).

Regarding future research, the authors recommend further studies on supply chains in the public sector context since literature is still scarce on efforts of SCM of different areas in the public sector. Public administration is a broad field of study and according to the analysis of the scientific literature, there are not many studies that relate the tools or methodologies of performance evaluation with the innumerous processes with public service. In addition, it is recommended to apply the MCDA-C methodology in the development of other models of performance evaluation in other processes, activities and functions existing in a public organization. These initiatives will not only allow the expansion of knowledge in the Public Administration field, but also the deepening of the researches of the multi-criteria methodologies within Brazilian public organizations.

The fact that the performance evaluation model constructed here was designed according to the perceptions, beliefs and opinions of the decision maker make this a limitation of this research, since it can only be applied in a unique context. On the other hand, it is also a characteristic that values the work done, since it personalizes the performance evaluation model and ensures its legitimacy and acceptance by the manager. In addition, it shows that the MCDA-C methodology is applicable in different contexts and situations, generating performance evaluation models specific to each context and decision maker.

Finally, it is expected that this research will assist in the development of other studies in the field of public administration and provide new insights for other research in the field.

REFERENCES

Afonso, M. H., Souza, J. d., Ensslin, S. R., & Ensslin, L. (2011). Como construir conhecimento sobre o tema de pesquisa? Aplicação do processo Proknow-C na busca de literatura sobre avaliação do desenvolvimento sustentável. *Revista de Gestão Social e Ambiental, 5*(2), 47-62.

Angelo Mori, P., & Doni, N. (2010). The economics of procurement contract awarding: problems and solutions in theory and practice. *Journal of public procurement, 10*(1), 93-120.

Arantes, F. P., Leite, M. S. A., Bornia, A. C., & Barbetta, P. A. (2018). Multidimensionality evaluation of supply chain management integration. *Independent Journal of Management & Production, 9*(1), 170-193.

Asif, M., & Searcy, C. (2014). A composite index for measuring performance in higher education institutions. *International Journal of Quality & Reliability Management, 31*(9), 983-1001.

Azevedo, R. C., Ensslin, L., de Oliveira Lacerda, R. T., França, L. A., González, C. J. I., Jungles, A. E., & Ensslin, S. R. (2011). Avaliação de desempenho do processo de orçamento: estudo de caso em uma obra de construção civil. *Ambiente Construído, 11*(1), 85-104.

Azevedo, R. C. d., Ensslin, L., Lacerda, R. T. d. O., França, L. A., Jungles, A. E., & Ensslin, S. R. (2013). Modelo para avaliação de desempenho: aplicação em um orçamento de uma obra de construção civil. *Production, 23*(4), 705-722.

Back, F., Ensslin, L., & Ensslin, S. (2012). Processo para construir o conhecimento inicial de pesquisa ilustrado ao tema gestão de recursos humanos. *Revista Pesquisa & Desenvolvimento em Engenharia de Produção*.

Bakar, A. H. A., Hakim, I. L., Chong, S. C., & Lin, B. (2009). Measuring supply chain performance among public hospital laboratories. *International Journal of Productivity and Performance Management, 59*(1), 75-97.

Bana e Costa, C. A. (1993). Três convicções fundamentais na prática do apoio à decisão. *Pesquisa Operacional, 13*(1), 9-20.

Bana e Costa, C. A., De Corte, J.-M., & Vansnick, J.-C. (2017). M-MACBETH Version 3.2 User's Guide. *Bana Consulting, Lisbon*.

Bana e Costa, C. A., & Vansnick, J.-C. (1995). General overview of the MACBETH approach. In *Advances in multicriteria analysis* (pp. 93-100): Springer.

Barata, L. R. B., Mendes, J. D. V., & Bittar, O. (2010). Hospitais de ensino e o Sistema Único de Saúde. *Rev Adm Saúde, 12*(46), 7-14.

Barzilai, J. (2001). *On the foundations of measurement.* Paper presented at the 2001 IEEE International Conference on Systems, Man and Cybernetics. e-Systems and e-Man for Cybernetics in Cyberspace (Cat. No. 01CH37236).

Bastos, T. R. (2018). *Proposta de Modelo de Avaliação de Desempenho para o Apoio à Gestão de Unidades Organizacionais em uma IFES: Um Estudo de Caso.* (MSc.), FURG,

Beamon, B. M. (1999). Measuring supply chain performance. *International Journal of Operations & Production Management, 19*(3), 275-292.

Behn, R. D. (2003). Why measure performance? Different purposes require different measures. *Public administration review, 63*(5), 586-606.

Bhatti, S. K., Singh, R. P., & Singh, I. (2015). Analytical model for performance measurement in healthcare sector of Punjab. *Journal of Modelling in Management, 10*(2), 226-237.

Bititci, U., Garengo, P., Dörfler, V., & Nudurupati, S. (2012). Performance measurement: challenges for tomorrow. *International journal of management reviews, 14*(3), 305-327.

Bititci, U., Turner, T., & Begemann, C. (2000). Dynamics of performance measurement systems. *International Journal of Operations & Production Management, 20*(6), 692-704.

Böhme, T., Williams, S., Childerhouse, P., Deakins, E., & Towill, D. (2014). Squaring the circle of healthcare supplies. *Journal of health organization and management, 28*(2), 247-265.

Bonacim, C. A. G., & de Araujo, A. M. P. (2009). Valor econômico agregado por hospitais universitários públicos. *RAE-Revista de Administração de Empresas, 49*(4), 419-433.

Bortoluzzi, S. C. (2013). Proposta teórico-metodológica fundamentada na avaliação de desempenho multicritério para a gestão do relacionamento de arranjo produtivo local (APL) e suas empresas individuais.

Bortoluzzi, S. C., Ensslin, S. R., & Ensslin, L. (2010). Avaliação de desempenho dos aspectos tangíveis e intangíveis da área de mercado: estudo de caso em uma média empresa industrial. *Revista Brasileira de Gestão de Negócios, 12*(37).

Bortoluzzi, S. C., Ensslin, S. R., & Ensslin, L. (2011). Avaliação de desempenho multicritério como apoio à gestão de empresas: aplicação em uma empresa de serviços. *Gestão & Produção, 18*(3), 633-650.

Bortoluzzi, S. C., Ensslin, S. R., Ensslin, L., & Valmorbida, S. M. I. (2014). Avaliação de desempenho de redes de pequenas e médias empresas (pmes): lacunas e oportunidades de pesquisa. *Revista Gestão Industrial, 9*(4).

Bourne, M., Mills, J., Wilcox, M., Neely, A., & Platts, K. (2000). Designing, implementing and updating performance measurement systems. *International Journal of Operations & Production Management, 20*(7), 754-771.

Burns, L. R. (2002). *The health care value chain: producers, purchasers, and providers*: Jossey-Bass San Francisco.

Cai, J., Liu, X., Xiao, Z., & Liu, J. (2009). Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment. *Decision support systems, 46*(2), 512-521.

Caiado, R. G. G., de Freitas Dias, R., Mattos, L. V., Quelhas, O. L. G., & Leal Filho, W. (2017). Towards sustainable development through the perspective of eco-efficiency - A systematic literature review. *Journal of Cleaner Production, 165*, 890-904. doi:https://doi.org/10.1016/j.jclepro.2017.07.166

Callender, G., & Matthews, D. (2000). Government purchasing: An evolving profession? *Journal of Public Budgeting, Accounting & Financial Management, 12*(2), 272-290.

Cardoso, T. L. (2017). *Avaliação de desempenho construtivista para apoiar a gestão da Universidade do Mindelo.* (Mestre em Contabilidade M. Sc.), UNIVERSIDADE FEDERAL DE SANTA CATARINA, Florianopolis.

Cardoso, T. L., Ensslin, S. R., & Dias, J. (2016). Avaliação de desempenho da sustentabilidade financeira da universidade do mindelo (cabo verde): um modelo multicritério construtivista. *Revista Eletrônica de Estratégia & Negócios, 9*(2), 234-264.

Castillo-Muñoz, C. A., Ripoll, V., & Urquidi, A. (2017). Voluntary disclosures on Corporate Social Responsibility (CSR): A bibliometric and systemic analysis. *Espacios, 38*(26).

Chan, F. T. (2003). Performance measurement in a supply chain. *The international journal of advanced manufacturing technology, 21*(7), 534-548.

Chaves, L. C., Ensslin, L., Ensslin, S. R., Petri, S. M., & Da Rosa, F. S. (2012). Gestão do processo decisório: mapeamento ao tema conforme as delimitações postas pelos pesquisadores. *Revista Eletrônica de Estratégia & Negócios, 5*(3), 3-27.

Chaves, L. C., Ensslin, L., Ensslin, S. R., Valmorbida, S. M. I., & Shinohara, K. J. (2013). Segurança de software: uma abordagem multicritério para avaliação de desempenho. *Pesquisa Operacional para o Desenvolvimento, 5*(2), 136-171.

Chen, D., Preston, D. S., & Xia, W. (2013). Enhancing hospital supply chain performance: A relational view and empirical test. *Journal of Operations Management, 31*(6), 391-408.

Chen, G.-s. (2010). *On the supply chain management of public hospital materials.* Paper presented at the E-Product E-Service and E-Entertainment (ICEEE), 2010 International Conference on.

Chopra, S., & Meindl, P. (2016). *Gestão da cadeia de suprimentos: estratégia, planejamento e operações*: Pearson.

Chorfi, Z., Benabbou, L., & Berrado, A. (2016). *A two stage DEA approach for evaluating the performance of public pharmaceutical products supply chains.* Paper presented at the Logistics Operations Management (GOL), 2016 3rd International Conference on.

Chorfi, Z., Berrado, A., & Benabbou, L. (2015). *Selection of Key Performance Indicators for Supply Chain monitoring using MCDA.* Paper presented at the 2015 10th International Conference on Intelligent Systems: Theories and Applications (SITA).

Christopher, M. (2016). *Logistics & supply chain management*: Pearson UK.

Conceição, S. V., & Quintão, R. T. (2004). Avaliação do desempenho logístico da cadeia brasileira de suprimentos de refrigerantes. *Gestão e Produção, 11*(3), 441-453.

Cooper, M. C., & Ellram, L. M. (1993). Characteristics of supply chain management and the implications for purchasing and logistics strategy. *The international journal of logistics management, 4*(2), 13-24.

Creswell, J. W., & Poth, C. N. (2017). *Qualitative inquiry and research design: Choosing among five approaches*: Sage publications.

CSCMP. (2018). CSCMP Supply Chain Management Definitions and Glossary. Retrieved from https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx?hkey=60879588-f65f-4ab5-8c4b-6878815ef921

Da Rosa, F. S., Ensslin, S. R., Ensslin, L., & Lunkes, R. J. (2011). Gestão da evidenciação ambiental: um estudo sobre as potencialidades e oportunidades do tema. *Engenharia Sanitária Ambiental, 16*(1), 157-166.

Darling, M., & Wise, S. (2010). Not your father's supply chain. Following best practices to manage inventory can help you save big. *Materials management in health care, 19*(4), 30-33.

de Araújo, A. L., Rodrigues, B. Á., Telles, L. B., Vaz, M. C. S., & Bittencourt, J. V. M. (2017). A bibliometric analysis of the Scielo database: a Brazilian portfolio of the solidarity economy. *Scientometrics, 112*(1), 1-20. doi:10.1007/s11192-017-2382-2

de Campos, E. A. R., Resende, L. M., & Pontes, J. (2017). Barriers, external aspects and trust factors in horizontal networks of companies: a theoretical proposal for the construction of a model for evaluation of trust. *Journal of Intelligent Manufacturing*, 1-16.

de Carvalho, G. D. G., Cruz, J. A. W., De Carvalho, H. G., Duclós, L. C., & Stankowitz, R. d. F. (2017). Innovativeness measures: A bibliometric review and a classification proposal. *International Journal of Innovation Science, 9*(1), 81-101. doi:10.1108/IJIS-10-2016-0038

de Moraes, L., Garcia, R., Ensslin, L., da Conceição, M. J., & de Carvalho, S. M. (2010). The multicriteria analysis for construction of benchmarkers to support the Clinical Engineering in the Healthcare Technology Management. *European Journal of Operational Research, 200*(2), 607-615.

de Oliveira, C. C., Moro, A. R. P., Ulbricht, L., Belinelli, M., de Souza, G. F. M., Gabriel, M., & Zattar, I. C. (2017). Ergonomic evaluation of workload by milk production – A bibliometric analysis. *Annals of Agricultural and Environmental Medicine, 24*(3), 376-382. doi:10.26444/aaem/75505

Dias, L. C., & Tsoukiàs, A. (2003). *On the constructive and other approaches in decision aiding.* Paper presented at the Proceedings of the 57th meeting of the EURO MCDA working group.

dos Santos Goffi, A., Bortoluzzi, S. C., Trojan, F., & Goffi, A. (2018). Abordagem multicritério na seleção de alternativas de tratamento de efluentes: uma revisão sistêmica da literatura. *Holos Environment, 18*(1), 28-43.

Dotoli, M., Epicoco, N., Falagario, M., & Sciancalepore, F. (2015). A cross-efficiency fuzzy Data Envelopment Analysis technique for performance evaluation of Decision Making Units under uncertainty. *Computers & Industrial Engineering, 79*, 103-114. doi:https://doi.org/10.1016/j.cie.2014.10.026

Dutra, A., Ripoll-Feliu, V. M., Ensslin, S. R., Ensslin, L., & Gonçalves, L. R. P. (2015). Opportunities for research on evaluation of seaport performance: A systemic analysis from international literature. *African Journal of Business Management, 9*(20), 704.

Dutra, A., Ripoll-Feliu, V. M., Fillol, A. G., Ensslin, S. R., & Ensslin, L. (2015). The construction of knowledge from the scientific literature about the theme seaport performance evaluation. *International Journal of Productivity and Performance Management, 64*(2), 243-269.

Elrod, C., Murray, S., & Bande, S. (2013). A review of performance metrics for supply chain management. *Engineering Management Journal, 25*(3), 39-50.

Ensslin, L., Dezem, V., Dutra, A., Ensslin, S. R., & Somensi, K. (2017). Management support for agricultural enterprises: a case study for a fruit-producing company. *International Food and Agribusiness Management Review, 20*(4), 493-510. doi:10.22434/ifamr2016.0152

Ensslin, L., Dezem, V., Dutra, A., Ensslin, S. R., & Somensi, K. (2017). Seaport-performance tools: an analysis of the international literature. *Maritime Economics & Logistics*. doi:10.1057/s41278-017-0083-7

Ensslin, L., Dutra, A., & Ensslin, S. R. (2000). MCDA: a constructivist approach to the management of human resources at a governmental agency. *International transactions in operational Research, 7*(1), 79-100.

Ensslin, L., Dutra, A., Ensslin, S. R., Krüger, A. C., & Gavazini, A. A. (2017). Avaliação multicritério de desempenho: o caso de um Tribunal de Justiça. *Cadernos Gestão Pública e Cidadania, 22*(71).

Ensslin, L., Dutra, A., Ensslin, S. R., Longaray, A. A., & Dezem, V. (2016). Modelo construtivista de apoio à gestão bancária. *Revista ESPACIOS| Vol. 37 (Nº 09) Año 2016.*

Ensslin, L., Ensslin, S., Dutra, A., Longaray, A., & Dezem, V. (2018). Performance assessment model for bank client's services and business development process: a constructivist proposal. *International Journal of Applied Decision Sciences, 11*(1), 100-126. doi:http://dx.doi.org/10.1504/IJADS.2018.088636

Ensslin, L., Ensslin, S., & Pinto, H. d. M. (2013). Processo de investigação e Análise bibliométrica: Avaliação da Qualidade dos Serviços Bancários. *RAC-Revista de Administração Contemporânea, 17*(3), 325-349.

Ensslin, L., Ensslin, S. R., Dutra, A., Nunes, N. A., & Reis, C. (2017). BPM governance: a literature analysis of performance evaluation. *Business Process Management Journal, 23*(1), 71-86. doi:10.1108/BPMJ-11-2015-0159

Ensslin, L., Ensslin, S. R., Lacerda, R., & Tasca, J. (2010). ProKnow-C, knowledge development process-constructivist. *Processo técnico com patente de registro pendente junto ao INPI. Brasil, 10*(4), 2015.

Ensslin, L., Ensslin, S. R., & Pacheco, G. C. (2012). Um estudo sobre segurança em estádios de futebol baseado na análise bibliométrica da literatura internacional. *Perspectivas em Ciência da Informação, 17*(2), 71-91.

Ensslin, L., Ensslin, S. R., Rocha, S., Marafon, A. D., & Medaglia, T. A. (2013). Modelo multicritério de apoio à decisão construtivista no processo de avaliação de fornecedores. *Production, 23*(2), 402-421.

Ensslin, L., Giffhorn, E., Ensslin, S. R., Petri, S. M., & Vianna, W. B. (2010). Avaliação do desempenho de empresas terceirizadas com o uso da metodologia multicritério de apoio à decisão-construtivista. *Pesquisa Operacional, 30*(1), 125-152.

Ensslin, L., Graziano, L. A. G., Dutra, A., & Dezem, V. (2017). Construction of knowledge about the theme performance evaluation of communication in public organs: an analysis of international literature. *Revista Ibero-Americana de Estrategia, 16*(3), 111-130.

Ensslin, L., Neto, G. M., & Noronha, S. M. (2001). *Apoio à decisão: metodologias para estruturação de problemas e avaliação multicritério de alternativas*: Insular.

Ensslin, L., Queiroz, S., Grzebieluckas, C., Ensslin, S. R., Nickel, E., Buson, M. A., & Balbim Jr., A. (2011). Identificação das necessidades do consumidor no processo de desenvolvimento de produtos: uma proposta de inovação ilustrada para o segmento automotivo. *Produção (São Paulo. Impresso), 21*(4), 555-569.

Ensslin, L., & Vianna, W. B. (2008). O design na pesquisa quali-quantitativa em engenharia de produção–questões epistemológicas. *Revista Produção Online, 8*(1).

Ensslin, S., Ensslin, L., Back, F., & Lacerda, R. (2013). Improved decision aiding in human resource management: a case using constructivist multi-criteria decision aiding. *International Journal of Productivity and Performance Management, 62*(7), 735-757.

Ensslin, S. R., de Carvalho, F. N., Gallon, A. V., & Ensslin, L. (2008). Uma metodologia multicritério (MCDA-C) para apoiar o gerenciamento do capital intelectual organizacional. *RAM. Revista de Administração Mackenzie, 9*(7).

Ensslin, S. R., Ensslin, L., Chaves, L. C., Gabriel, M., & de Oliveira, C. C. (2014). Seleção e Análise de Conteúdo de um Portfólio de Artigos sobre a Avaliação do Desempenho Logístico. *Revista ESPACIOS| Vol. 35 (Nº 13) Año 2014*.

Ensslin, S. R., Ensslin, L., Lacerda, R. T. d. O., & dos Santos Matos, L. (2013). Evidenciação do estado da arte do tema avaliação do desempenho na regulação de serviços públicos segundo a percepção dos pesquisadores. *Gestão Pública: Práticas e Desafios-ISSN: 2177-1243, 4*(1).

Epstein, M. J., & Roy, M.-J. (2001). Sustainability in action: Identifying and measuring the key performance drivers. *Long range planning, 34*(5), 585-604.

Essoussi, I. E. (2015). *A performance evaluation of some collaborative inventory management practices in the healthcare supply chain.* Paper presented at the Industrial Engineering and Systems Management (IESM), 2015 International Conference on.

Fan, X., & Zhang, S. (2016). Performance Evaluation for the Sustainable Supply Chain Management. In *Sustainable Supply Chain Management*: InTech.

Franco, L. A., & Montibeller, G. (2010). Facilitated modelling in operational research. *European Journal of Operational Research, 205*(3), 489-500.

Freire, A., Ely, D., Santana, L., Jungles, A., & Dalmau, M. (2017). *Use of games to student training in the civil engineering undergraduation course: A bibliometric analysis.* Paper presented at the 29th European Modeling and Simulation Symposium, EMSS 2017, Held at the International Multidisciplinary Modeling and Simulation Multiconference, I3M 2017.

Fryer, K., Antony, J., & Ogden, S. (2009). Performance management in the public sector. *International journal of public sector management, 22*(6), 478-498.

George, A. L., Bennett, A., Lynn-Jones, S. M., & Miller, S. E. (2005). *Case studies and theory development in the social sciences*: mit Press.

Ghalayini, A. M., & Noble, J. S. (1996). The changing basis of performance measurement. *International Journal of Operations & Production Management, 16*(8), 63-80.

Giffhorn, E., Ensslin, L., Ensslin, S. R., & Vianna, W. B. (2009). Aperfeiçoamento da gestão organizacional por meio da abordagem multicritério de apoio à decisão. *Revista Gestão Industrial, 5*(4).

Gil, A. C. (2008). *Métodos e técnicas de pesquisa social*: 6. ed. Ediitora Atlas SA.

Guedes, G. B., Paganin, L. B. Z., & Borsato, M. (2017). *Material flow mapping and industrial ecosystems: A literature structured review.* Paper presented at the Advances in Transdisciplinary Engineering.

Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International journal of production economics, 87*(3), 333-347.

Harrison, A., & Van Hoek, R. I. (2008). *Logistics management and strategy: competing through the supply chain*: Pearson Education.

Johnston, R., & Pongatichat, P. (2008). Managing the tension between performance measurement and strategy: coping strategies. *International Journal of Operations & Production Management, 28*(10), 941-967.

Kazemkhanlou, H., & Ahadi, H. R. (2014). *Study of performance measurement practices in supply chain management.* Paper presented at the Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management Bali, Indonesia.

Keeney, R. L. (1992). *Value-focused thinking: A path to creative decisionmaking*: Harvard University Press.

Keeney, R. L. (1996). Value-focused thinking: Identifying decision opportunities and creating alternatives. *European Journal of Operational Research, 92*(3), 537-549.

Khaldi, R., Chiheb, R., El Afia, A., Akaaboune, A., & Faizi, R. (2017). *Prediction of Supplier Performance: A Novel Dea-Anfis Based Approach.* Paper presented at the Proceedings of the 2nd international Conference on Big Data, Cloud and Applications.

Kleijnen, J. P., & Smits, M. T. (2003). Performance metrics in supply chain management. *Journal of the operational research society, 54*(5), 507-514.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*: New Age International.

Kumar, A., Ozdamar, L., & Peng Ng, C. (2005). Procurement performance measurement system in the health care industry. *International journal of health care quality assurance, 18*(2), 152-166.

Kurien, G. P., & Qureshi, M. N. (2011). Study of performance measurement practices in supply chain management. *International Journal of Business, Management and Social Sciences, 2*(4), 19-34.

Lacerda, R., Ensslin, L., & Ensslin, S. R. (2012). A bibliometric analysis of strategy and performance measurement. *Gestão & Produção, 19*(1), 59-78.

Lacerda, R., Ensslin, L., Krueger, A., & Ensslin, S. R. (2017). Performance Evaluation in the Brazilian Public Sector. *Public Administration Research, 6*(1), 1.

Lacerda, R. T., Ensslin, L., & Ensslin, S. R. (2009). *A study case about a software project management success metrics.* Paper presented at the Software Engineering Workshop (SEW), 2009 33rd Annual IEEE.

Lacerda, R. T. d. O., Ensslin, L., & Ensslin, S. R. (2011). A performance measurement framework in portfolio management: A constructivist case. *Management Decision, 49*(4), 648-668.

Lacerda, R. T. d. O., Ensslin, L., Ensslin, S. R., & Dutra, A. (2014). A constructivist approach to manage business process as a dynamic capability. *Knowledge and Process Management, 21*(1), 54-66.

Landry, M. (1995). A note on the concept of'problem'. *Organization studies, 16*(2), 315-343.

Lega, F., Marsilio, M., & Villa, S. (2013). An evaluation framework for measuring supply chain performance in the public healthcare sector: evidence from the Italian NHS. *Production Planning & Control, 24*(10-11), 931-947.

Lohman, C., Fortuin, L., & Wouters, M. (2004). Designing a performance measurement system: A case study. *European Journal of Operational Research, 156*(2), 267-286.

Longaray, A., Ensslin, L., Ensslin, S., Alves, G., Dutra, A., & Munhoz, P. (2018). Using MCDA to evaluate the performance of the logistics process in public hospitals: the case of a Brazilian teaching hospital. *International transactions in operational Research, 25*(1), 133-156. doi:10.1111/itor.12387

Longaray, A. A., & Ensslin, L. (2014). Uso da MCDA na identificação e mensuração da performance dos critérios para a certificação dos hospitais de ensino no âmbito do SUS. *Production, 24*(1), 41-56.

Longaray, A. A., Ensslin, L., Ensslin, S. R., & da Rosa, I. O. (2015). Assessment of a Brazilian public hospital's performance for management purposes: A soft operations research case in action. *Operations Research for Health Care, 5*, 28-48.

Lummus, R. R., & Alber, K. L. (1997). *Supply chain management: balancing the supply chain with customer demand*: APICS Educational & Research Foundation.

Lyrio, M. V. L., Dutra, A., Ensslin, S. R., & Ensslin, L. (2007). Construção de um Modelo de Avaliação de Desempenho da Secretaria de Desenvolvimento Regional da Grande Florianópolis: a proposta da metodologia multicritério de apoio à decisão construtivista. *Contextus-Revista Contemporânea de Economia e Gestão, 5*(2), p. 31-40.

Malik, M., Abdallah, S., & Hussain, M. (2016). Assessing supplier environmental performance: applying analytical hierarchical process in the United Arab Emirates healthcare chain. *Renewable and Sustainable Energy Reviews, 55*, 1313-1321.

Marafon, A. D., Ensslin, L., Lacerda, R. T. d. O., & Ensslin, S. R. (2015). The effectiveness of multi-criteria decision aid methodology: A case study of R&D management. *European Journal of Innovation Management, 18*(1), 86-109.

Marcis, J., Bortoluzzi, S. C., de Lima, E. P., & da Costa, S. E. G. (2018). Sustainability performance evaluation of agricultural cooperatives' operations: a systemic review of the literature. *Environment, Development and Sustainability*. doi:10.1007/s10668-018-0095-1

McKone-Sweet, K. E., Hamilton, P., & Willis, S. B. (2005). The Ailing Healthcare Supply Chain: A Prescription for Change. *Journal of Supply Chain Management, 41*(1), 4-17. doi:doi:10.1111/j.1745-493X.2005.tb00180.x

Medori, D., & Steeple, D. (2000). A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management, 20*(5), 520-533.

Melão, N., & Pidd, M. (2000). A conceptual framework for understanding business processes and business process modelling. *Information systems journal, 10*(2), 105-129.

Melnyk, S. A., Bititci, U., Platts, K., Tobias, J., & Andersen, B. (2014). Is performance measurement and management fit for the future? *Management Accounting Research, 25*(2), 173-186.

Mendonça, A. K. d. S., Vaz, C. R., Lezana, Á. G. R., Anacleto, C. A., & Paladini, E. P. (2017). Comparing Patent and Scientific Literature in Airborne Wind Energy. *Sustainability, 9*(6), 915.

Micheli, P., & Mari, L. (2014). The theory and practice of performance measurement. *Management Accounting Research, 25*(2), 147-156.

Migiro, S., & Ambe, I. (2008). Evaluation of the implementation of public sector supply chain management and challenges: A case study of the central district municipality, North west province, South Africa.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*: sage.

Minahan, T. (2007). Can supply management technology be the antidote to the healthcare crisis? *Health management technology, 28*(9), 52, 54-55.

Mitropoulos, P., Talias, M. A., & Mitropoulos, I. (2015). Combining stochastic DEA with Bayesian analysis to obtain statistical properties of the efficiency scores: An application to Greek public hospitals. *European Journal of Operational Research, 243*(1), 302-311.

Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L. (2015). *Purchasing and supply chain management*: Cengage Learning.

Munaro, H. L. R., & Munaro, S. d. A. P. (2017). INTERVENÇÕES UTILIZANDO O MODELO TRANSTEORÉTICO PARA A ATIVIDADE FÍSICA: ESTUDO BIBLIOMÉTRICO. *Saúde. com, 13*(1).

Najmi, A., Gholamian, M. R., & Makui, A. (2013). Supply chain performance models: A literature review on approaches, techniques, and criteria. *JOSCM: Journal of Operations and Supply Chain Management, 6*(2), 94.

Neely, A., Gregory, M., & Platts, K. (1995). Performance measurement system design: a literature review and research agenda. *International Journal of Operations & Production Management, 15*(4), 80-116.

Neil, R. (2004). The ol'switcheroo. Using knowledge from other industries. *Materials management in health care, 13*(5), 14-18.

Nogueira, D. L., Lira, G. V., Albuquerque, I. M. A. N., & Linhares, M. S. C. (2015). Avaliação dos Hospitais de Ensino no Brasil: uma revisão sistemática. *Rev. bras. educ. méd*, 151-158.

OECD. (2017). *Tackling Wasteful Spending on Health*.

Paschoal, M. L. H., & Castilho, V. (2010). Implementação do sistema de gestão de materiais informatizado do Hospital Universitário da Universidade de São Paulo. *Revista da Escola de Enfermagem da USP, 44*(4), 984-988.

Pereira, L. G., & Tortorella, G. L. (2018). A Literature Review on Lean Manufacturing in Small Manufacturing Companies. In *Progress in Lean Manufacturing* (pp. 69-89): Springer.

Pigatto, G., & Alcantara, R. L. C. (2007). Relacionamento colaborativo no canal de distribuição: uma matriz para análise. *Gestão e Produção, 14*(1), 155-167.

Pinto, A. C. C. S., Silva, D. A. S., Ensslin, L., Reis, P. F., Vilagra, J. M., Vergara, L. G. L., & Moro, A. R. P. (2018). Injuries of Repetitive Efforts in Workers from the Poultry Meat Industry: A Bibliometric Analysis of Literature. *Sustainability, 10*(1), 250.

Richardson, R. J. (1999). *Pesquisa social: métodos e técnicas* (Atlas Ed. 3 ed.).

Robson, C. (2011). *Real World Research: A Resource for Social Scientists and Practitioner-researchers* (3 ed.).

Rocha, S. K., Schnorrenberger, D., Gasparetto, V., & Lunkes, R. J. (2017). Intangible asset evaluation approaches: a literature review. *Revista Catarinense da Ciência Contábil, 16*(47), 9-25.

Rodrigues, A. P., Fernandes, M. L., Rodrigues, M. F. F., Bortoluzzi, S. C., Gouvea da Costa, S. E., & Pinheiro de Lima, E. (2018). Developing criteria for performance assessment in municipal solid waste management. *Journal of Cleaner Production, 186*, 748-757. doi:https://doi.org/10.1016/j.jclepro.2018.03.067

Roy, B. (1993). Decision science or decision-aid science? *European Journal of Operational Research, 66*(2), 184-203. doi:https://doi.org/10.1016/0377-2217(93)90312-B

Roy, B. (1994). On operational research and decision aid. *European Journal of Operational Research, 73*(1), 23-26.

Roy, B. (1996). *Multicriteria methodology for decision aiding* (B. Roy Ed.): Springer US.

Roy, B., & Vanderpooten, D. (1996). The European school of MCDA: Emergence, basic features and current works. *Journal of Multi-Criteria Decision Analysis, 5*(1), 22-38.

Ryan, J. K. (2005). Systems engineering: Opportunities for health care. *Building a Better Delivery System: A New Engineering/Health Care Partnership*, 141.

Saaty, T. L. (1980). The analytic hierarchy process: planning, priority setting, resources allocation. *New York: McGraw, 281*.

Somensi, K., Ensslin, S., Dutra, A., Ensslin, L., Ripoll-Feliu, V. M., & Dezem, V. (2017). Knowledge construction about port performance: Evaluation: An international literature analysis. *Intangible Capital, 13*(4), 720-744. doi:10.3926/ic.956

Stake, R. E. (2008). Qualitative case studies.

Staughton, R., & Johnston, R. (2005). Operational performance gaps in business relationships. *International Journal of Operations & Production Management, 25*(4), 320-332.

Stevens, S. S. (1946). On the theory of scales of measurement.

Stock, J. R., & Boyer, S. L. (2009). Developing a consensus definition of supply chain management: a qualitative study. *International Journal of Physical Distribution & Logistics Management, 39*(8), 690-711.

Stumpf, I. R. C. (2001). *Disponibilização de teses e dissertações em comunicação em texto completo: projeto de pesquisa.* Paper presented at the Congresso Brasileiro de Ciência da Comunicação (24.: 2001: Campo Grande, MS). A mídia impressa, o livro e o desafio das novas tecnologias. Campo Grande: Intercom, 2001.

Supeekit, T., Somboonwiwat, T., & Kritchanchai, D. (2016). DEMATEL-modified ANP to evaluate internal hospital supply chain performance. *Computers & Industrial Engineering, 102*, 318-330. doi:https://doi.org/10.1016/j.cie.2016.07.019

Tasca, J., Ensslin, L., Ensslin, S., & Alves, M. B. M. (2010). An approach for selecting a theoretical framework for the evaluation of training programs. *Journal of European Industrial Training, 34*(7), 631-655.

Tasca, J. E., Ensslin, L., & Ensslin, S. R. (2012). A avaliação de programas de capacitação: um estudo de caso na administração pública. *Revista de Administração Pública-RAP, 46*(3).

Tasca, J. E., Ensslin, L., & Ensslin, S. R. (2013). A construção de um referencial teórico sobre a avaliação de desempenho de programas de capacitação. *Ensaio: Avaliação e Políticas Públicas em Educação, 21*(79).

Thiel, G. G., Ensslin, S. R., & Ensslin, L. (2017). Street lighting management and performance evaluation: opportunities and challenges. *Lex Localis, 15*(2), 303.

Tridapalli, J. P., Fernandes, E., & Vieira Machado, W. (2011). Gestão da cadeia de suprimento do setor público: uma alternativa para controle de gastos correntes no Brasil. *Revista de Administração Pública-RAP, 45*(2).

Uzsoy, R. (2005). Supply-chain management and health care delivery: Pursuing a system-level understanding. *Building a Better Delivery System: A New Engineering/Health Care Partnership*, 143-146.

Valmorbida, S., & Ensslin, L. (2016). Construção de conhecimento sobre aval iação de desempenho para gestão organizacional: uma investigação nas pe squisas científicas internacionais. *Revista Contemporânea de Contabilidade, 13*(28).

Valmorbida, S., & Ensslin, S. (2017). Performance evaluation of university rankings: literature review and guidelines for future research. *International Journal of Business Innovation and Research, 14*(4), 479-501.

Valmorbida, S. M. I., & Ensslin, S. R. (2017). Performance evaluation of university rankings: literature review and guidelines for future research. *International Journal of Business Innovation and Research, 14*(4), 479-501.

Valmorbida, S. M. I., Ensslin, S. R., Ensslin, L., & Ripoll-Feliu, V. M. (2016). Rankings universitários mundiais. Que dizem os estudos internacionais? *REICE. Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 14*(2), 5-29.

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523-538. doi:10.1007/s11192-009-0146-3

Van Eck, N. J., & Waltman, L. (2014). Visualizing bibliometric networks. In *Measuring scholarly impact* (pp. 285-320): Springer.

Vaz, C. R., Lezana, A. G. R., & Maldonado, M. U. (2017). Sustainability in the automotive sector: An analysis of structured content. *Journal on Innovation and Sustainability. RISUS ISSN 2179-3565, 8*(2), 79-103.

Vegini, D., Back, F. T., Ensslin, L., Souza, M., Ensslin, S., & Machado, T. (2012). Modelo de avaliação de desempenho de fogões com foco em ergonomia, utilizando o método MCDA-C. *Revista Produção Online, 12*(2), 423-454.

Vitorino Filho, V. A., de Camargo Júnior, J. B., Pires, S. R. I., & Argoud, A. R. T. T. (2017). A produção acadêmica internacional em práticas e iniciativas na gestão colaborativa em cadeias de suprimentos: um estudo bibliométrico. *Revista Produção Online, 17*(2), 567.

World Health Organization, W. (2010). *The world health report: health systems financing: the path to universal coverage: executive summary*. Retrieved from

Wynn-Williams, K. L. H. (2005). Performance assessment and benchmarking in the public sector: An example from New Zealand. *Benchmarking, 12*(5), 482-492.

Yaffe, J., Montgomery, P., Hopewell, S., & Shepard, L. D. (2012). Empty Reviews: A Description and Consideration of Cochrane Systematic Reviews with No Included Studies. *PLOS ONE, 7*(5), e36626. doi:10.1371/journal.pone.0036626

Yin, R. K. (2015). *Estudo de Caso-: Planejamento e Métodos*: Bookman editora.

Zamcopé, F. C., Ensslin, L., Ensslin, S. R., & Dutra, A. (2010). Modelo para avaliar o desempenho de operadores logísticos: um estudo de caso na indústria têxtil. *Gestão & Produção, 17*(4), 693-705.

Zimmermann, H.-J. (2000). An application-oriented view of modeling uncertainty. *European Journal of Operational Research, 122*(2), 190-198.

APPENDIX A: PRIMARY EVALUATION ELEMENTS (PEEs) AND CONCEPTS FOR THE PERFORMANCE EVALUATION OF PUBLIC-SECTOR HEALTH CARE SUPPLY CHAIN MANAGEMENT AT HU-FURG/EBSERH

PEE	CONCEPT
Institutional influence	1. Lobby Institutionally ... Increase the risk of failure
University support	2. Receive support from the University ... Have difficulty solving problems
Autonomy	3. Be the main responsible for all institutional operations ... Depend on the university for a certain activity
New specialties	4. Expand the areas of specialties ... Transfer patients to other institutions
Important aid from the Support Foundation	5. Get support from the foundation ... Lack support at the time of need
Ombudsman service	6. Minimize requests through the ombudsman's office ... Have a large volume of complaints, demonstrating dissatisfaction.
Continuous Improvement	7. Seek to improve performance always ... Have deficiency in processes
Institution Growth	8. Lead to uniform growth in all areas ... Focus only in some specific areas
Interest of the population	9. Attend the population as best as possible ... Give excuses always, due to insufficiency
Provide good service to the community	10. Ensure good service to the community ... Be criticized for management failures
Transparency	11. Ensure transparency of results for the population ... Show only inefficiency for the population
Self-sufficiency	12. Making the HU independent of the university ... Be dependent on the university
FURG / EBSERH Joint Partnership	13. Function entirely as a university hospital... Operate as a FURG / EBSERH joint venture
Results based management	14. Provide results within the appropriate time frame ... Disregard users' wishes
Communication	15. Talk and exchange information regularly ... Waste time and quality for lack of communication
Rational use	16. Avoid waste ... Always be lacking something
Government funds	17. Receive funds for health regularly ... Default on commitments
Fundraising	18. Guarantee resources for full operation ... Have a

	demand greater than capacity
Availability of funds	19. Have funds to fulfill all planning ... Work with limited resources
Lack of definition in budgetary and financial matters	20. Guarantee funds to operations ... Deal with budget insecurity
Payment to suppliers	21. Have supplies available ... Lack supplies due to payment irregularities
Different times for settlement of bills	22. Have higher payment speed ... Delay payments to suppliers
Difficulty in budget action	23. Place suppliers that cannot afford payment delays in higher liquidity payable accounts ... Have difficulty paying suppliers
Accounts with no funds	24. Adjust the liquidity of the accounts to the payment of suppliers ... Delay payment to suppliers
Health contract	25. Establish quantitative and qualitative goals of health care and hospital management ... Losing the incentive for signing the Contract
Fund raising from development agencies	26. Develop initiatives to raise funds together with development agencies and other institutions ... Miss the opportunity to raise funds
Operation of health posts	27. Ensure full operation of the hospital ... Fail due to overcrowding in the health care structure
Maintenance	28. Recover infrastructure ... Exhaust infrastructure
Modernization	29. Offer care in appropriate and quality environments ... Lack quality of care due to precariousness
Precarious physical structure	30. Improve the organization of work spaces ... Work separately doing related things
Bulk purchases	31. Find larger storage spaces ... Limit purchase orders
Large flow of patients	32. Ensure good care for all patients despite overcrowding ... Fail to attend due to lack of supplies/equipment
Truncated information flow	33. Avoid a truncated flow of information ... Lose time and resources correcting inconsistencies
Easy registration of orders	34. Facilitate the registration of purchase orders in the system ... Delay the beginning of the purchasing process.
Information system management	35. Reducing rework due to diverse data sources ... Find errors in the flow of information
Real time access	36. Have access to information from anywhere ... Find difficulties in accessing information

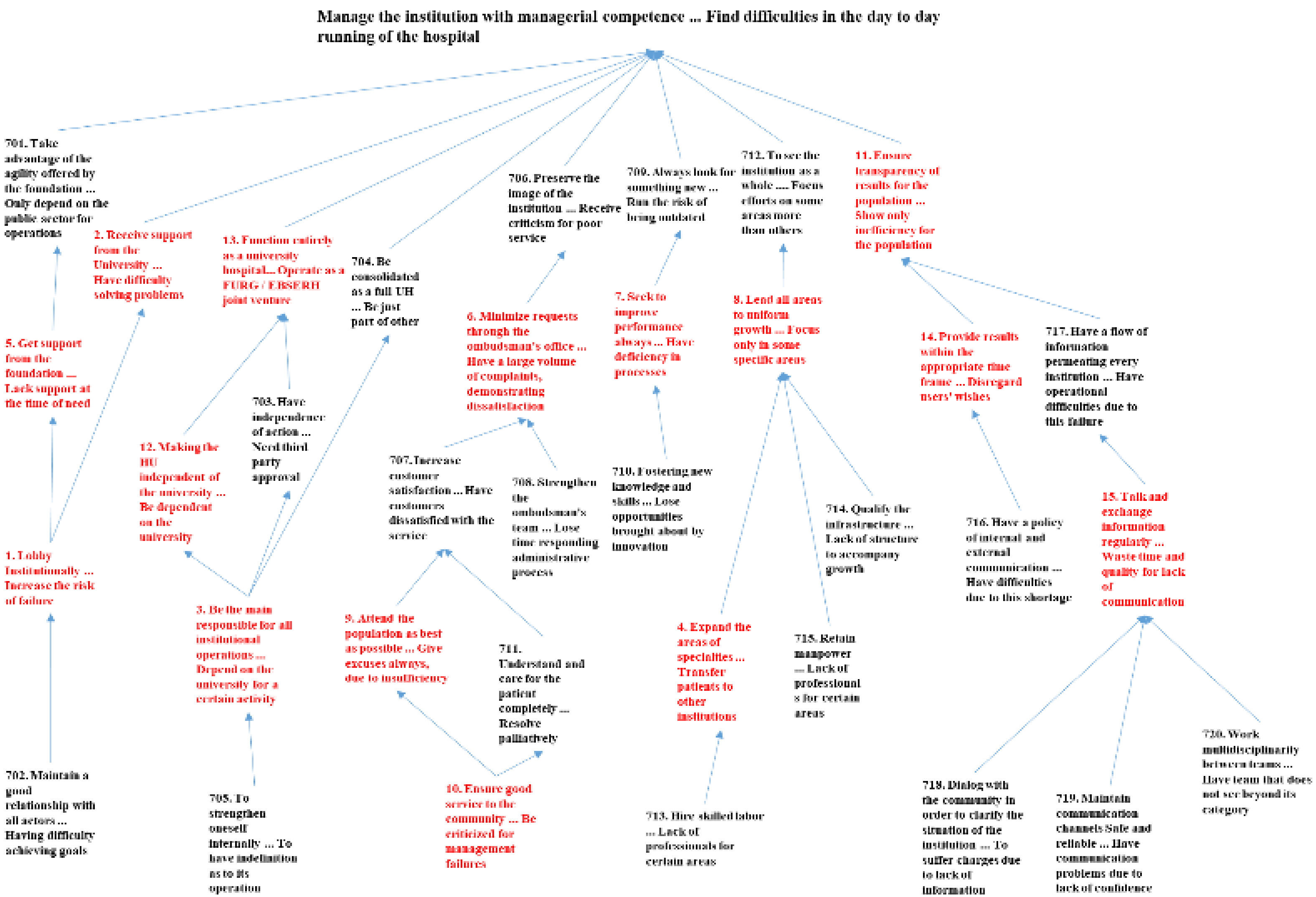
Interconnection of the budget and financial information	37. Link all operations through systems ... Lose time using traditional means
Data entry	38. Facilitate the standardization ... Find difficulties in the acquisition of goods and services
Process automation	39. Fill in all information into the system … have difficulties searching for data
Student Cost	40. Guarantee resources for teaching ... Restrict the funds allocated to the institution
Medical residency	41. Advance research and qualification of the medical residency ... Lose the professional to other centers
Care staff in the supply sector	42. Involve care teams in the supply sector ... Depend only on the administrative staff
Choice of suppliers	43. Have clear descriptions ... Receive products of doubtful quality
Standardization	44. Maintain consistency of items received and used ... Receive different products, inconsistent with the order
Verification of products from new suppliers	45. Guarantee the quality of products delivered ... Receive defective products
Learning process	46. Order supplies correctly ... Have constant difficulties in purchases
Attractive demand for suppliers	47. Decrease process time ... Delay to receive supplies
Mapping of hospital items	48. Facilitate the buying process ... Receive wrong products
Prepared bidders	49. Prevent adventurous bidders from entering the purchasing process ... Open space for adventurers
Purchasing on national network	50. Buy on national network ... Purchase units individually
Buy by electronic trading	51. Buy by electronic trading ... Buy by other dissuaded means
Access to prices and purchase information	52. Buy efficiently ... Have errors in the bidding process
Punctual and fractional purchases	53. Reduce direct purchase to cover planning errors ... Use legislative mechanisms to address purchasing planning shortcomings
Group order items	54. Make the Mix attractive ... Lack supplier for that group
Credibility of the institution with the suppliers	55. Increase the credibility of the institution with the suppliers ... Lose suppliers due to lack of commitment of the institution.
Legal deadlines for purchase procedures	56. Be careful with deadlines for processes ... Run out of supplies or equipment

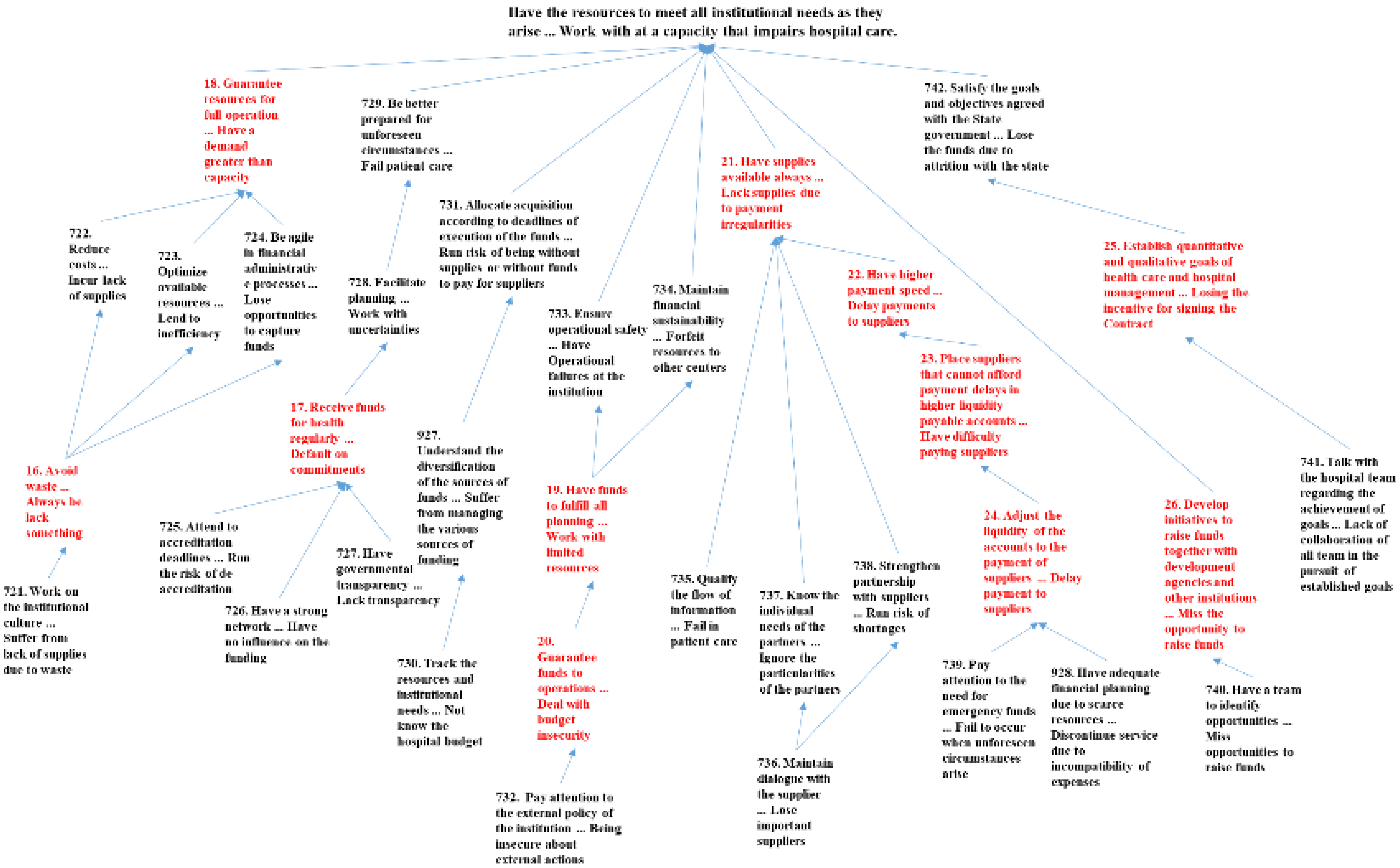
Preference for quality	57. Be Careful to test products ... Receive defective lots
Warranty control	58. Ensure all materials have their warranty checked ... Deal with equipment failure with a lack of warranty
Control of validity	59. Ensure that all supplies are not expired ... Have expired products
Return of non-standard products	60. Have quality products ... Generate expenditures for public coffers
Difficulties of suppliers	61. Guarantee the delivery of orders ... Trigger administrative procedures for noncompliance
Notify noncompliance	62. Maintain a firm position with suppliers ... Cause losses to the public coffers
Understanding the operations of the partners	63. Understand times that companies need ... Always out of stock
Automated stock control	64. Have an automatic control of the inventory level ... Lack information indicating the need to purchase /order delivery.
Batch purchase	65. Pay attention to storage capacity ... Acquire more than the structure can handle
Exchange of information	66. Learn best practices ... Always be out of date
Support from other institutions	67. Get support from other HUs ... Be isolated in operation as a branch
Networks of institutions	68. Strengthen the network ... Stay alone on its operation
Comparison with private sector health	69. Value public health ... Keep comparing public and private health for complains
Depoliticization of health	70. Separate health and politics ... Work under uncertainty
External policy interference	71. Avoid political issues ... Succumb to external pressures
New management	72. To have attention in the exchange of management ... To impair the work by political impasses
Succession after administrative changes	73. Ensure succession of the ongoing work ... Destroy previous work
Teaching hospital	74. Train human resources ... Lack qualified professionals in the future
Frequent change of legislation	75. Work with compliance with current legislation ... Have accountability problems
Control on the supervision of the contract	76. Ensure the correct supervision of the contract with the contractor ... demonstrate ignorance to the supervisory bodies; Ensure the correct supervision of the contract with the contracted company ... not cause loss to the public coffers
Organizational culture	77. Prioritize planning as culture ... Suffer from shortage

	of supplies and equipment
Annual planning (demand history)	78. Learn from past mistakes ... repeat the same past difficulties
Strategic development plan	79. Align actions to the institutional strategic development plan ... Work disjointedly
Predictability	80. Have the predictability of the entire bidding process ... Difficulty predicting the timing for purchases
Concrete and objective goals	81. Have measurable and objective goals ... Have a disjointed planning
Workforce planning	82. Have adequate workforce for smooth operation ... Overload some sector
Impossibility of precise planning of the bidding process	83. Ensure that the need for hiring is planned in a timely manner ... Have the service discontinued due to failure to plan the process.
Cohesion at work	84. Lead teams to do their best ... Lack a leadership that guides the team
Involvement and Responsibility	85. Stimulate the commitment of employees ... have unproductive employees at the workplace
Have the best team	86. Ensure good service to the community ... Display inefficiency for the population
Quantitative of the workforce	87. Hire the ideal workforce size ... Overtask some professionals
Well described job positions and attributes	88. Divide work properly ... Deal with employees doing different tasks
New employees	89. Ensure conditions to keep new employees ... Prevent them from using the institution as a springboard to other places
Loss of employees	90. Offer a structure that will make them settle here ... Lose employees to other institutions
Training and qualification of public agents	91. Qualify the work provided ... Generate dissatisfaction with the population
Competencies	92. Adapt professional expertise to the need of the sector ... Ignore the employee's professional training
Environment conducive to the development of potentialities	93. Welcome employees ... Increase absenteeism and conflict in the workplace
Personal factors	94. Recognize the special needs of professionals when these arise ... Experience lack of professional commitment
Dismissal of support foundation employees	95. Conduct the dismissal process with dignity ... Mistreat workers already weakened by dismissal

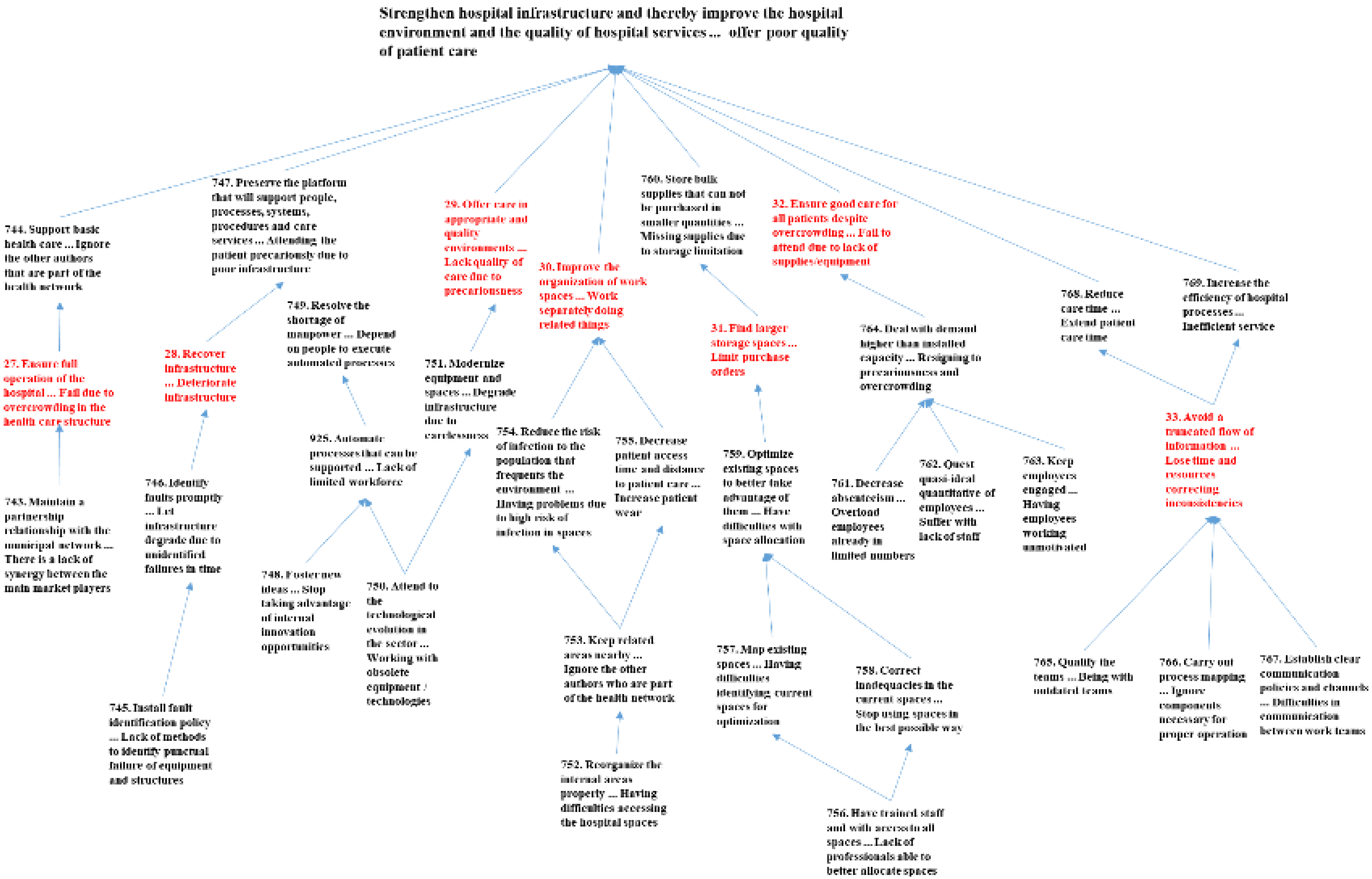
Outsourcing	96. Work with quality in outsourcing processes ... Treat outsourced employees with indifference
Institutional harmony	97. Reduce the gulf between the classes that constitute the hospital ... Have difficulties in performing tasks
Teamwork	98. Work in unison, united and solid ... Have friction between employees

APPENDIX B: COGNITIVE MAPS BY AREAS OF CONCERN

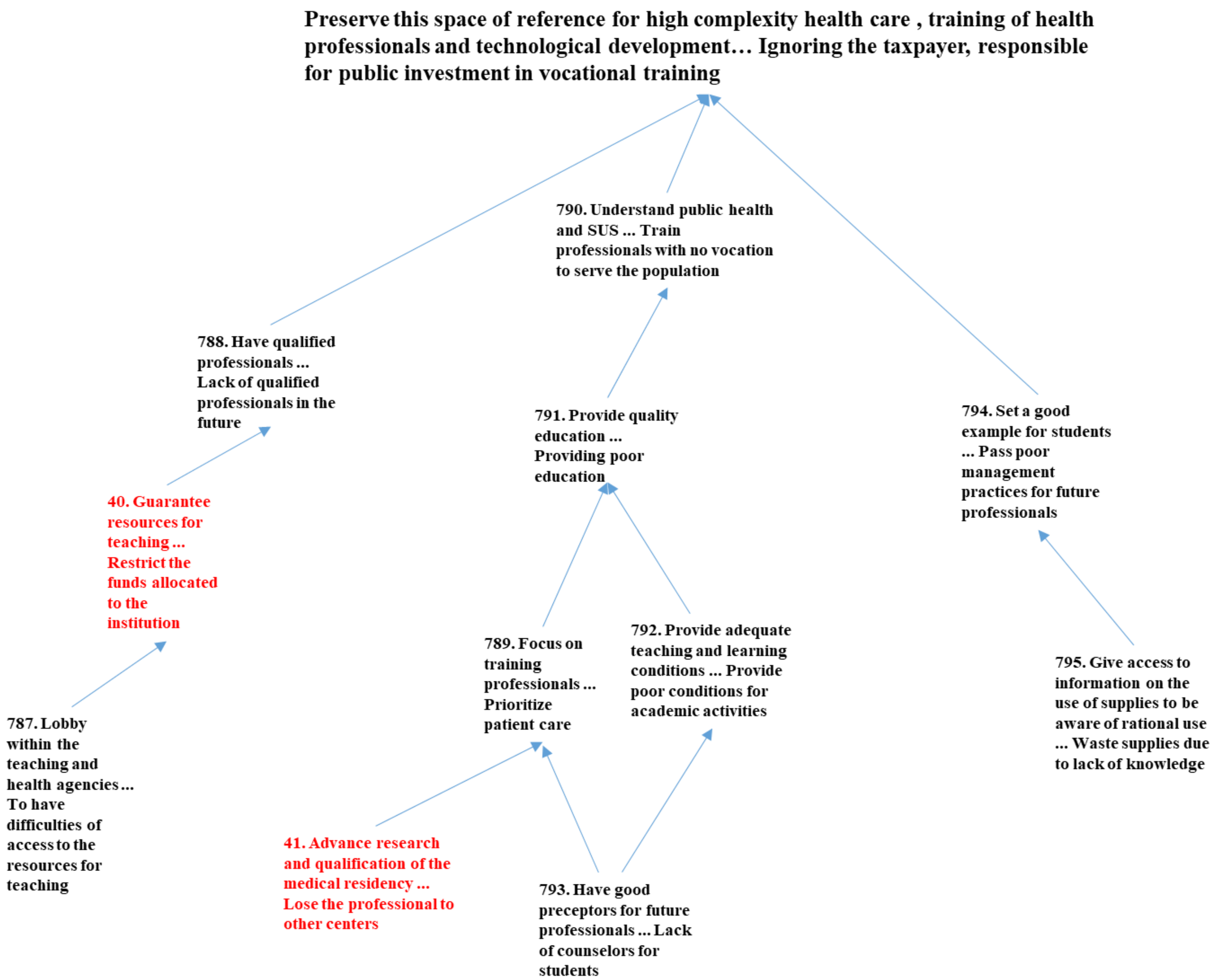


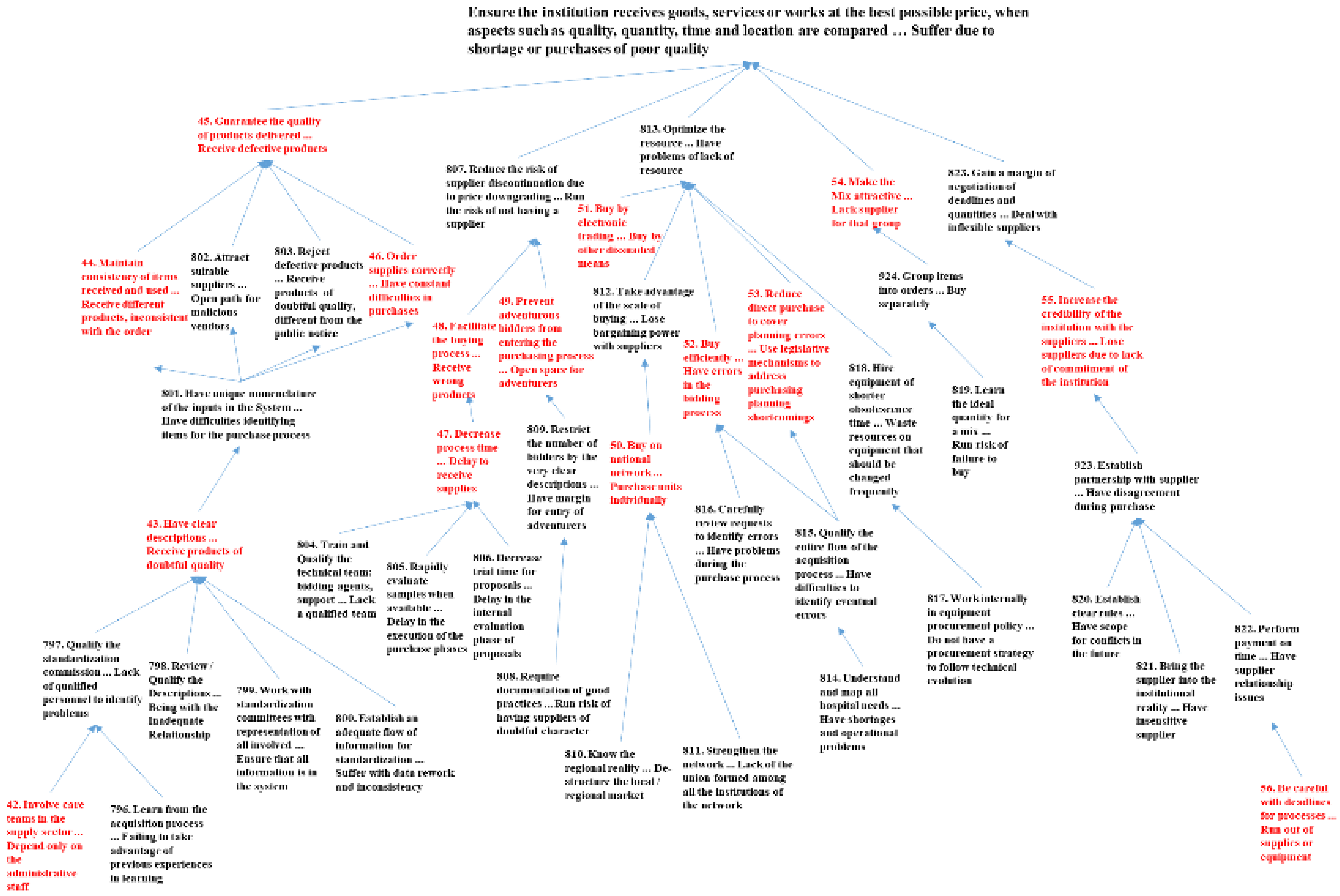


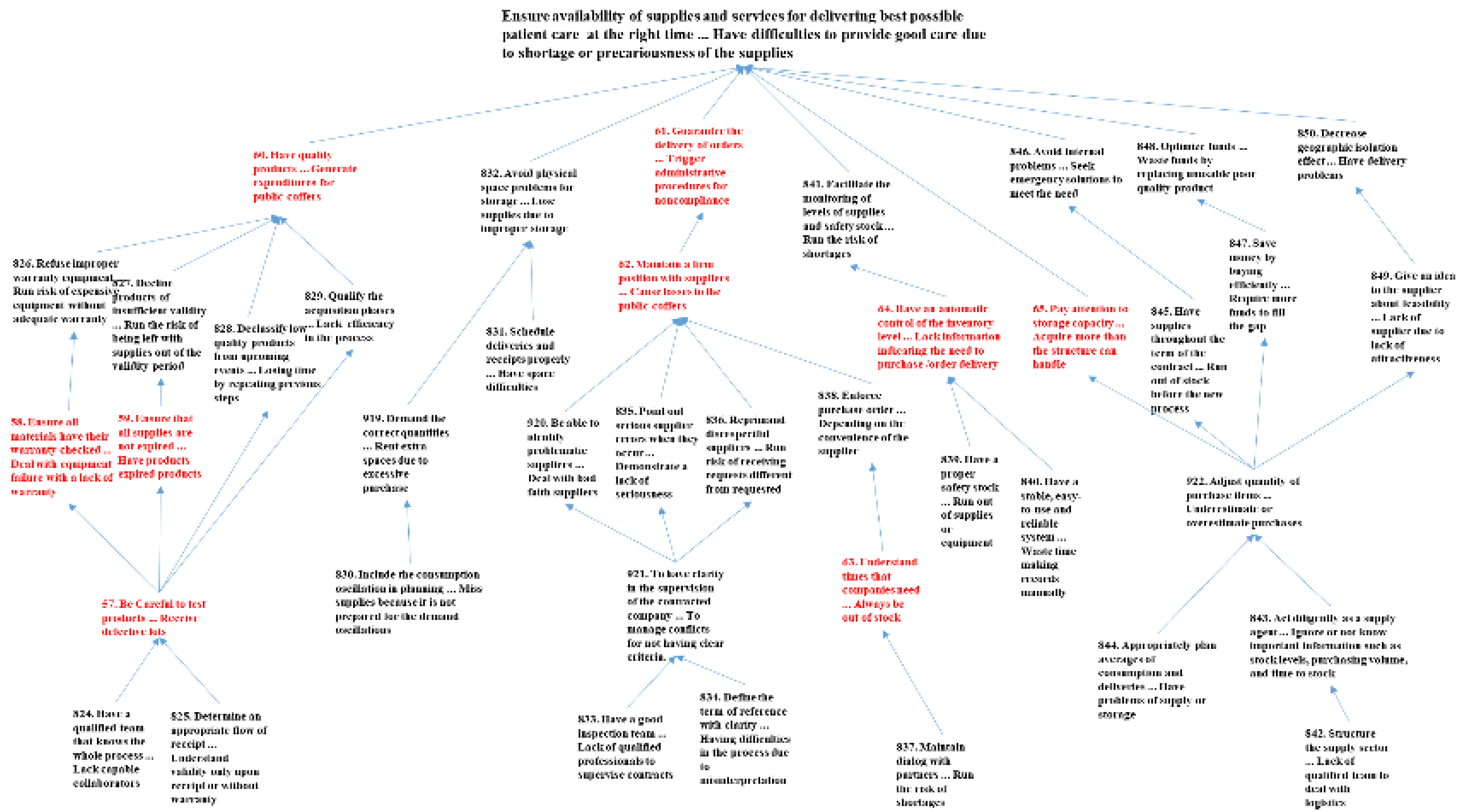
Have the resources to meet all institutional needs as they arise ... Work with at a capacity that impairs hospital care.
18. Guarantee resources for full operation ... Have a demand greater than capacity
729. Be better prepared for unforeseen circumstances ... Fail patient care
742. Satisfy the goals and objectives agreed with the State government ... Lose the funds due to attrition with the state
21. Have supplies available always ... Lack supplies due to payment irregularities
731. Allocate acquisition according to deadlines of execution of the funds ... Run risk of being without supplies or without funds to pay for suppliers
722. Reduce costs ... Incur lack of supplies
723. Optimize available resources ... Lead to inefficiency
724. Be agile in financial administrativ e processes ... Lose opportunities to capture funds
728. Facilitate planning ... Work with uncertainties
734. Maintain financial sustainability ... Forfeit resources to other centers
733. Ensure operational safety ... Have Operational failures at the institution
22. Have higher payment speed ... Delay payments to suppliers
25. Establish quantitative and qualitative goals of health care and hospital management ... Losing the incentive for signing the Contract
23. Place suppliers that cannot afford payment delays in higher liquidity payable accounts ... Have difficulty paying suppliers
17. Receive funds for health regularly ... Default on commitments
927. Understand the diversification of the sources of funds ... Suffer from managing the various sources of funding
16. Avoid waste ... Always be lack something
19. Have funds to fulfill all planning ... Work with limited resources
741. Talk with the hospital team regarding the achievement of goals ... Lack of collaboration of all team in the pursuit of established goals
24. Adjust the liquidity of the accounts to the payment of suppliers ... Delay payment to suppliers
26. Develop initiatives to raise funds together with development agencies and other institutions ... Miss the opportunity to raise funds
725. Attend to accreditation deadlines ... Run the risk of de accreditation
727. Have governmental transparency ... Lack transparency
738. Strengthen partnership with suppliers ... Run risk of shortages
735. Qualify the flow of information ... Fail in patient care
737. Know the individual needs of the partners ... Ignore the particularities of the partners
721. Work on the institutional culture ... Suffer from lack of supplies due to waste
726. Have a strong network ... Have no influence on the funding
20. Guarantee funds to operations ... Deal with budget insecurity
730. Track the resources and institutional needs ... Not know the hospital budget
739. Pay attention to the need for emergency funds ... Fail to occur when unforeseen circumstances arise
928. Have adequate financial planning due to scarce resources ... Discontinue service due to incompatibility of expenses
740. Have a team to identify opportunities ... Miss opportunities to raise funds
736. Maintain dialogue with the supplier ... Lose important suppliers
732. Pay attention to the external policy of the institution ... Being insecure about external actions

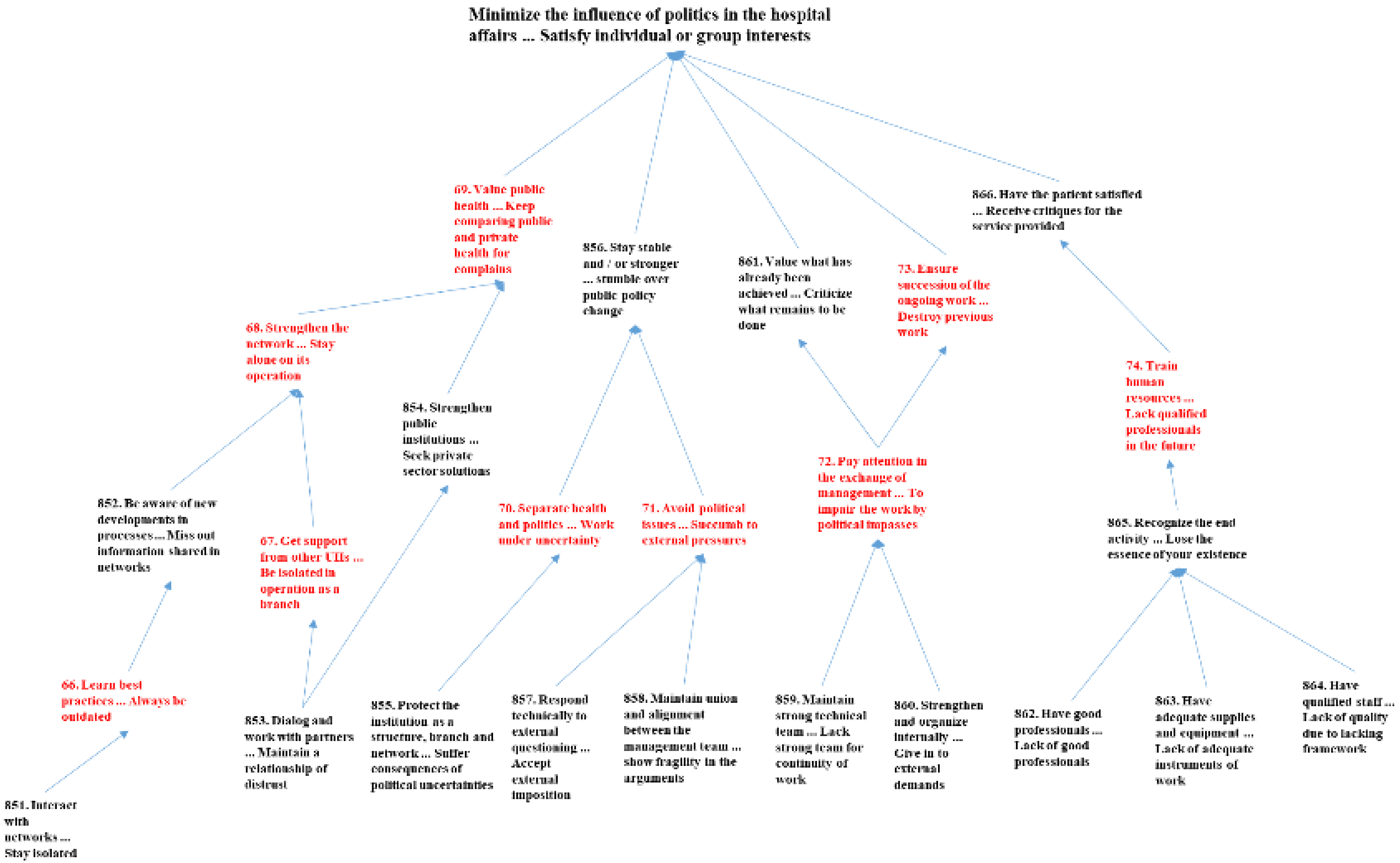

Strengthen hospital infrastructure and thereby improve the hospital environment and the quality of hospital services ... offer poor quality of patient care
744. Support basic health care ... Ignore the other authors that are part of the health network
747. Preserve the platform that will support people, processes, systems, procedures and care services ... Attending the patient precariously due to poor infrastructure
29. Offer care in appropriate and quality environments ... Lack quality of care due to precariousness
30. Improve the organization of work spaces ... Work separately doing related things
760. Store bulk supplies that can not be purchased in smaller quantities ... Missing supplies due to storage limitation
32. Ensure good care for all patients despite overcrowding ... Fail to attend due to lack of supplies/equipment
768. Reduce care time ... Extend patient care time
769. Increase the efficiency of hospital processes ... Inefficient service
27. Ensure full operation of the hospital ... Fail due to overcrowding in the health care structure
28. Recover infrastructure ... Deteriorate infrastructure
749. Resolve the shortage of manpower ... Depend on people to execute automated processes
751. Modernize equipment and spaces ... Degrade infrastructure due to carelessness
31. Find larger storage spaces ... Limit purchase orders
764. Deal with demand higher than installed capacity ... Resigning to precariousness and overcrowding
33. Avoid a truncated flow of information ... Lose time and resources correcting inconsistencies
925. Automate processes that can be supported ... Lack of limited workforce
754. Reduce the risk of infection to the population that frequents the environment ... Having problems due to high risk of infection in spaces
755. Decrease patient access time and distance to patient care ... Increase patient wear
759. Optimize existing spaces to better take advantage of them ... Have difficulties with space allocation
761. Decrease absenteeism ... Overload employees already in limited numbers
762. Quest quasi-ideal quantitative of employees ... Suffer with lack of staff
763. Keep employees engaged ... Having employees working unmotivated
743. Maintain a partnership relationship with the municipal network ... There is a lack of synergy between the main market players
746. Identify faults promptly ... Let infrastructure degrade due to unidentified failures in time
748. Foster new ideas ... Stop taking advantage of internal innovation opportunities
750. Attend to the technological evolution in the sector ... Working with obsolete equipment / technologies
753. Keep related areas nearby ... Ignore the other authors who are part of the health network
757. Map existing spaces ... Having difficulties identifying current spaces for optimization
758. Correct inadequacies in the current spaces ... Stop using spaces in the best possible way
765. Qualify the teams ... Being with outdated teams
766. Carry out process mapping ... Ignore components necessary for proper operation
767. Establish clear communication policies and channels ... Difficulties in communication between work teams
745. Install fault identification policy ... Lack of methods to identify punctual failure of equipment and structures
752. Reorganize the internal areas properly ... Having difficulties accessing the hospital spaces
756. Have trained staff and with access to all spaces ... Lack of professionals able to better allocate spaces

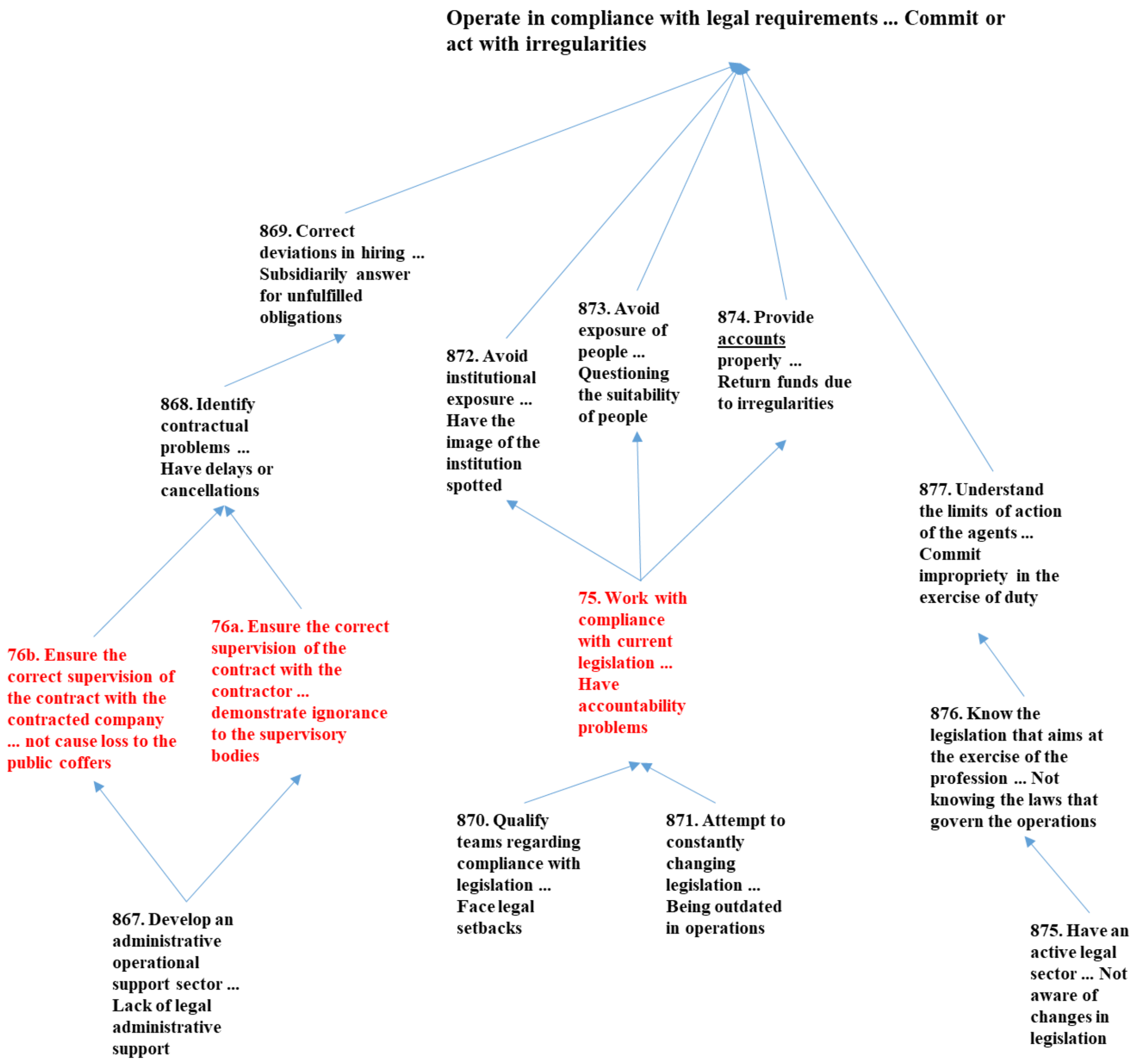

Provide the manager with an overview of all processes for decision making ... Lack the tools to support decision making
772. Have agility in the flow of information in the system ... Running the risk of shortages
776. Decrease operational cost ... Have unnecessary costs
777. Reduce response time for an operation ... Delay to respond to needs
778. Facilitate the identification of the lack of supplies ... Fail to identify the supply needs
779. Reduce dissatisfaction with the lack of material ... Receive complaints of lack of inputs
38. Facilitate the standardization ... Find difficulties in the acquisition of goods and services
786. Transform information into a format that generates resource ... Fail to receive resources due to lack of information
34. Facilitate the registration of purchase orders in the system ... Delay the beginning of the purchasing process
35. Reducing rework due to diverse data sources ... Find errors in the flow of information
36. Have access to information from anywhere ... Find difficulties in accessing information
39. Fill in all information into the system … have difficulties searching for data
37. Link all operations through systems ... Lose time using traditional means
775. Have greater control over the system and the data generated ... Depending on external support for full system management
771. Avoid resistance to system use ... Keep information updated in system
926. Have own stable system for the HU ... Get vulnerable with third party systems
780. Have a single database for the institution ... Having difficulties searching for data in various places
781. Qualify the flow of information ... Have incomplete or error data
782. Have a robust system that takes care of all the operations ... Suffering failures due to lack or system errors
784. Develop the information culture ... Fail to take advantage of IT's advantage
785. Identify points of information loss in the flow ... Fail to collect important data
770. Train employees on the use of systems ... Failure to take full advantage of the system
773. Have headquarters support for acquisition ... Bear all costs alone
774. Qualify the IT team ... Hire third party systems
783. Invest in IT ...

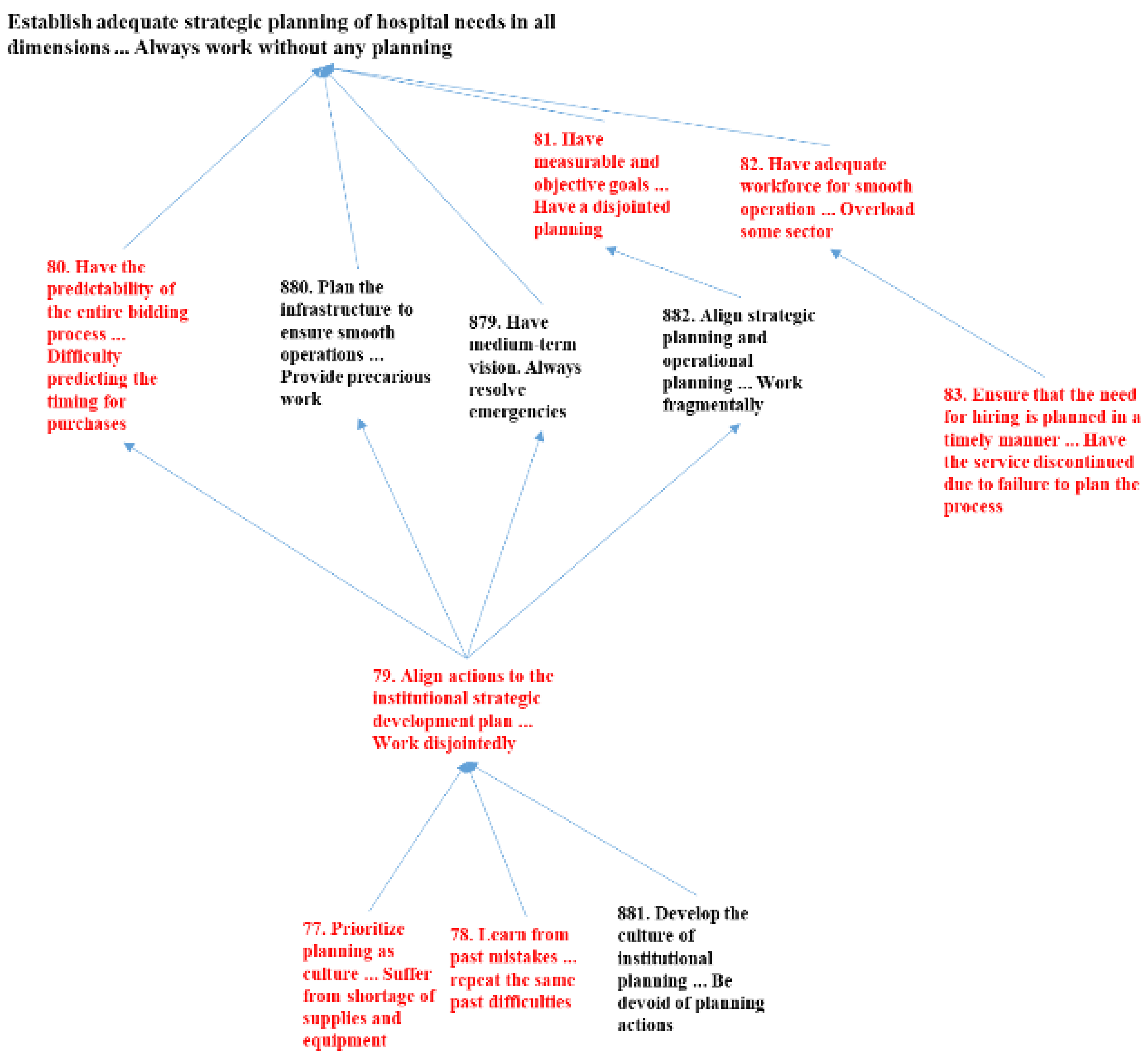

Preserve this space of reference for high complexity health care , training of health professionals and technological development… Ignoring the taxpayer, responsible for public investment in vocational training
788. Have qualified professionals ... Lack of qualified professionals in the future
790. Understand public health and SUS ... Train professionals with no vocation to serve the population
794. Set a good example for students ... Pass poor management practices for future professionals
40. Guarantee resources for teaching ... Restrict the funds allocated to the institution
791. Provide quality education ... Providing poor education
789. Focus on training professionals ... Prioritize patient care
792. Provide adequate teaching and learning conditions ... Provide poor conditions for academic activities
795. Give access to information on the use of supplies to be aware of rational use ... Waste supplies due to lack of knowledge
787. Lobby within the teaching and health agencies ... To have difficulties of access to the resources for teaching
41. Advance research and qualification of the medical residency ... Lose the professional to other centers
793. Have good preceptors for future professionals ... Lack of counselors for students

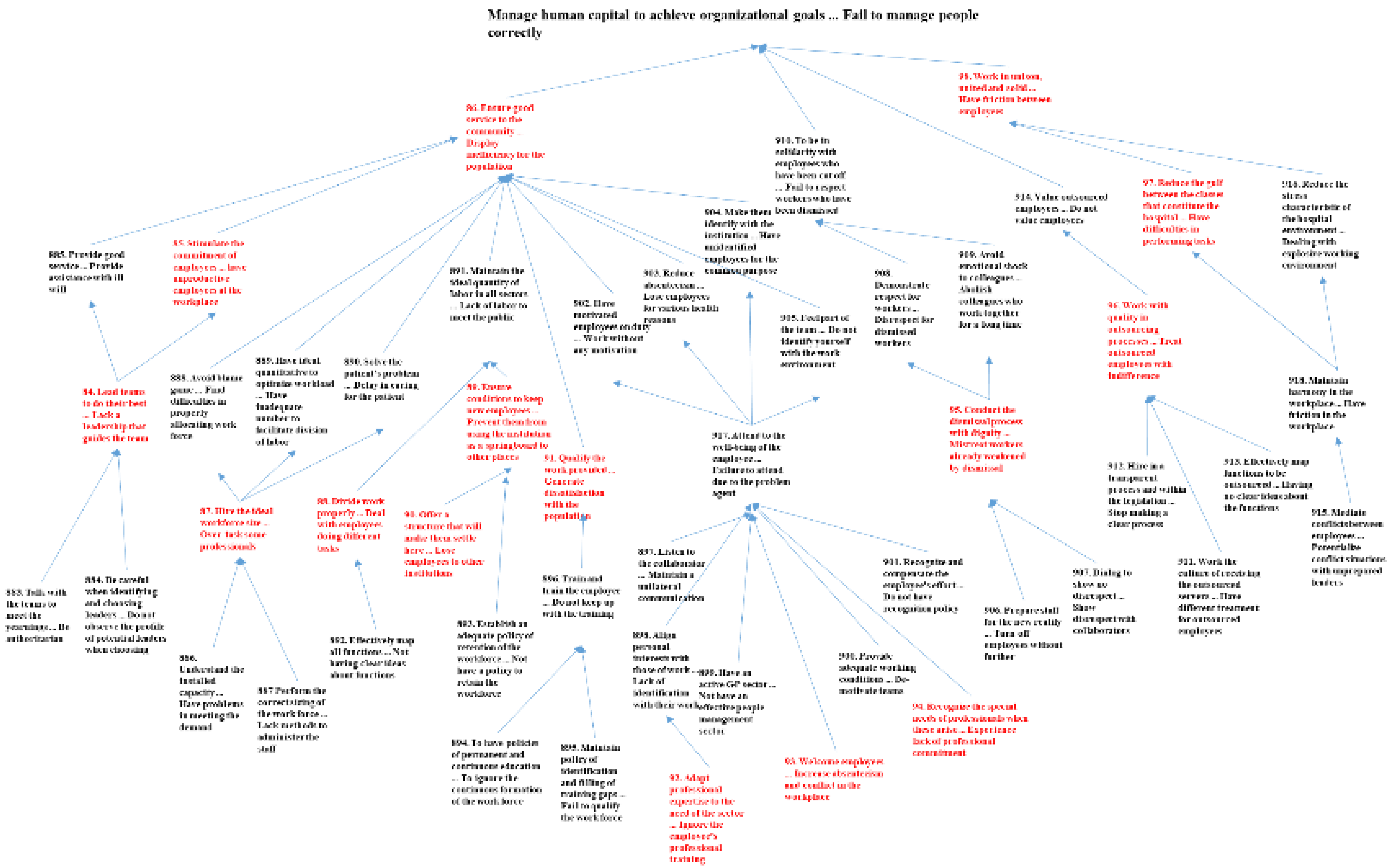

Ensure the institution receives goods, services or works at the best possible price, when aspects such as quality, quantity, time and location are compared … Suffer due to shortage or purchases of poor quality
45. Guarantee the quality of products delivered … Receive defective products
807. Reduce the risk of supplier discontinuation due to price downgrading … Run the risk of not having a supplier
813. Optimize the resource … Have problems of lack of resource
54. Make the Mix attractive … Lack supplier for that group
823. Gain a margin of negotiation of deadlines and quantities … Deal with inflexible suppliers
44. Maintain consistency of items received and used … Receive different products, inconsistent with the order
802. Attract suitable suppliers … Open path for malicious vendors
803. Reject defective products … Receive products of doubtful quality, different from the public notice
46. Order supplies correctly … Have constant difficulties in purchases
51. Buy by electronic trading … Buy by other discounted means
48. Facilitate the buying process … Receive wrong products
49. Prevent adventurous bidders from entering the purchasing process … Open space for adventurers
812. Take advantage of the scale of buying … Lose bargaining power with suppliers
52. Buy efficiently … Have errors in the bidding process
53. Reduce direct purchase to cover planning errors … Use legislative mechanisms to address purchasing planning shortcomings
924. Group items into orders … Buy separately
55. Increase the credibility of the institution with the suppliers … Lose suppliers due to lack of commitment of the institution
801. Have unique nomenclature of the inputs in the System … Have difficulties identifying items for the purchase process
818. Hire equipment of shorter obsolescence time … Waste resources on equipment that should be changed frequently
819. Learn the ideal quantity for a mix … Run risk of failure to buy
47. Decrease process time … Delay to receive supplies
809. Restrict the number of bidders by the very clear descriptions … Have margin for entry of adventurers
50. Buy on national network … Purchase units individually
923. Establish partnership with supplier … Have disagreement during purchase
816. Carefully review requests to identify errors … Have problems during the purchase process
43. Have clear descriptions … Receive products of doubtful quality
815. Qualify the entire flow of the acquisition process … Have difficulties to identify eventual errors
804. Train and Qualify the technical team: bidding agents, support … Lack a qualified team
805. Rapidly evaluate samples when available … Delay in the execution of the purchase phases
806. Decrease trial time for proposals … Delay in the internal evaluation phase of proposals
817. Work internally in equipment procurement policy … Do not have a procurement strategy to follow technical evolution
820. Establish clear rules … Have scope for conflicts in the future
822. Perform payment on time … Have supplier relationship issues
797. Qualify the standardization commission … Lack of qualified personnel to identify problems
798. Review / Qualify the Descriptions … Being with the Inadequate Relationship
799. Work with standardization committees with representation of all involved … Ensure that all information is in the system
800. Establish an adequate flow of information for standardization … Suffer with data rework and inconsistency
808. Require documentation of good practices … Run risk of having suppliers of doubtful character
814. Understand and map all hospital needs … Have shortages and operational problems
821. Bring the supplier into the institutional reality … Have insensitive supplier
810. Know the regional reality … De-structure the local / regional market
811. Strengthen the network … Lack of the union formed among all the institutions of the network
56. Be careful with deadlines for processes … Run out of supplies or equipment
42. Involve care teams in the supply sector … Depend only on the administrative staff
796. Learn from the acquisition process … Failing to take advantage of previous experiences in learning


Ensure availability of supplies and services for delivering best possible patient care at the right time ... Have difficulties to provide good care due to shortage or precariousness of the supplies
60. Have quality products ... Generate expenditures for public coffers
832. Avoid physical space problems for storage ... Lose supplies due to improper storage
61. Guarantee the delivery of orders ... Trigger administrative procedures for noncompliance
841. Facilitate the monitoring of levels of supplies and safety stock... Run the risk of shortages
846. Avoid internal problems ... Seek emergency solutions to meet the need
848. Optimize funds ... Waste funds by replacing unusable poor quality product
850. Decrease geographic isolation effect ... Have delivery problems
826. Refuse improper warranty equipment Run risk of expensive equipment without adequate warranty
827. Decline products of insufficient validity ... Run the risk of being left with supplies out of the validity period
828. Declassify low quality products from upcoming events ... Losing time by repeating previous steps
829. Qualify the acquisition phases ... Lack efficiency in the process
831. Schedule deliveries and receipts properly ... Have space difficulties
62. Maintain a firm position with suppliers ... Cause losses to the public coffers
64. Have an automatic control of the inventory level ... Lack information indicating the need to purchase /order delivery
65. Pay attention to storage capacity ... Acquire more than the structure can handle
845. Have supplies throughout the term of the contract ... Run out of stock before the new process
847. Save money by buying efficiently ... Require more funds to fill the gap
849. Give an idea to the supplier about feasibility ... Lack of supplier due to lack of attractiveness
58. Ensure all materials have their warranty checked ... Deal with equipment failure with a lack of warranty
59. Ensure that all supplies are not expired ... Have products expired products
919. Demand the correct quantities ... Rent extra spaces due to excessive purchase
920. Be able to identify problematic suppliers ... Deal with bad faith suppliers
835. Point out serious supplier errors when they occur ... Demonstrate a lack of seriousness
836. Reprimand disrespectful suppliers ... Run risk of receiving requests different from requested
838. Enforce purchase order ... Depending on the convenience of the supplier
839. Have a proper safety stock ... Run out of supplies or equipment
840. Have a stable, easy-to use and reliable system ... Waste time making records manually
922. Adjust quantity of purchase items ... Underestimate or overestimate purchases
57. Be Careful to test products ... Receive defective lots
830. Include the consumption oscillation in planning ... Miss supplies because it is not prepared for the demand oscillations
921. To have clarity in the supervision of the contracted company ... To manage conflicts for not having clear criteria.
63. Understand times that companies need ... Always be out of stock
844. Appropriately plan averages of consumption and deliveries ... Have problems of supply or storage
843. Act diligently as a supply agent ... Ignore or not know important information such as stock levels, purchasing volume, and time to stock
824. Have a qualified team that knows the whole process ... Lack capable collaborators
825. Determine an appropriate flow of receipt ... Understand validity only upon receipt or without warranty
833. Have a good inspection team ... Lack of qualified professionals to supervise contracts
834. Define the term of reference with clarity ... Having difficulties in the process due to misinterpretation
837. Maintain dialog with partners ... Run the risk of shortages
842. Structure the supply sector ... Lack of qualified team to deal with logistics


Minimize the influence of politics in the hospital affairs ... Satisfy individual or group interests
69. Value public health ... Keep comparing public and private health for complains
856. Stay stable and / or stronger ... stumble over public policy change
861. Value what has already been achieved ... Criticize what remains to be done
73. Ensure succession of the ongoing work ... Destroy previous work
866. Have the patient satisfied ... Receive critiques for the service provided
68. Strengthen the network ... Stay alone on its operation
854. Strengthen public institutions ... Seek private sector solutions
74. Train human resources ... Lack qualified professionals in the future
72. Pay attention in the exchange of management ... To impair the work by political impasses
852. Be aware of new developments in processes ... Miss out information shared in networks
70. Separate health and politics ... Work under uncertainty
71. Avoid political issues ... Succumb to external pressures
865. Recognize the end activity ... Lose the essence of your existence
67. Get support from other UHs ... Be isolated in operation as a branch
66. Learn best practices ... Always be outdated
853. Dialog and work with partners ... Maintain a relationship of distrust
855. Protect the institution as a structure, branch and network ... Suffer consequences of political uncertainties
857. Respond technically to external questioning ... Accept external imposition
858. Maintain union and alignment between the management team ... show fragility in the arguments
859. Maintain strong technical team ... Lack strong team for continuity of work
860. Strengthen and organize internally ... Give in to external demands
862. Have good professionals ... Lack of good professionals
863. Have adequate supplies and equipment ... Lack of adequate instruments of work
864. Have qualified staff ... Lack of quality due to lacking framework
851. Interact with networks ... Stay isolated

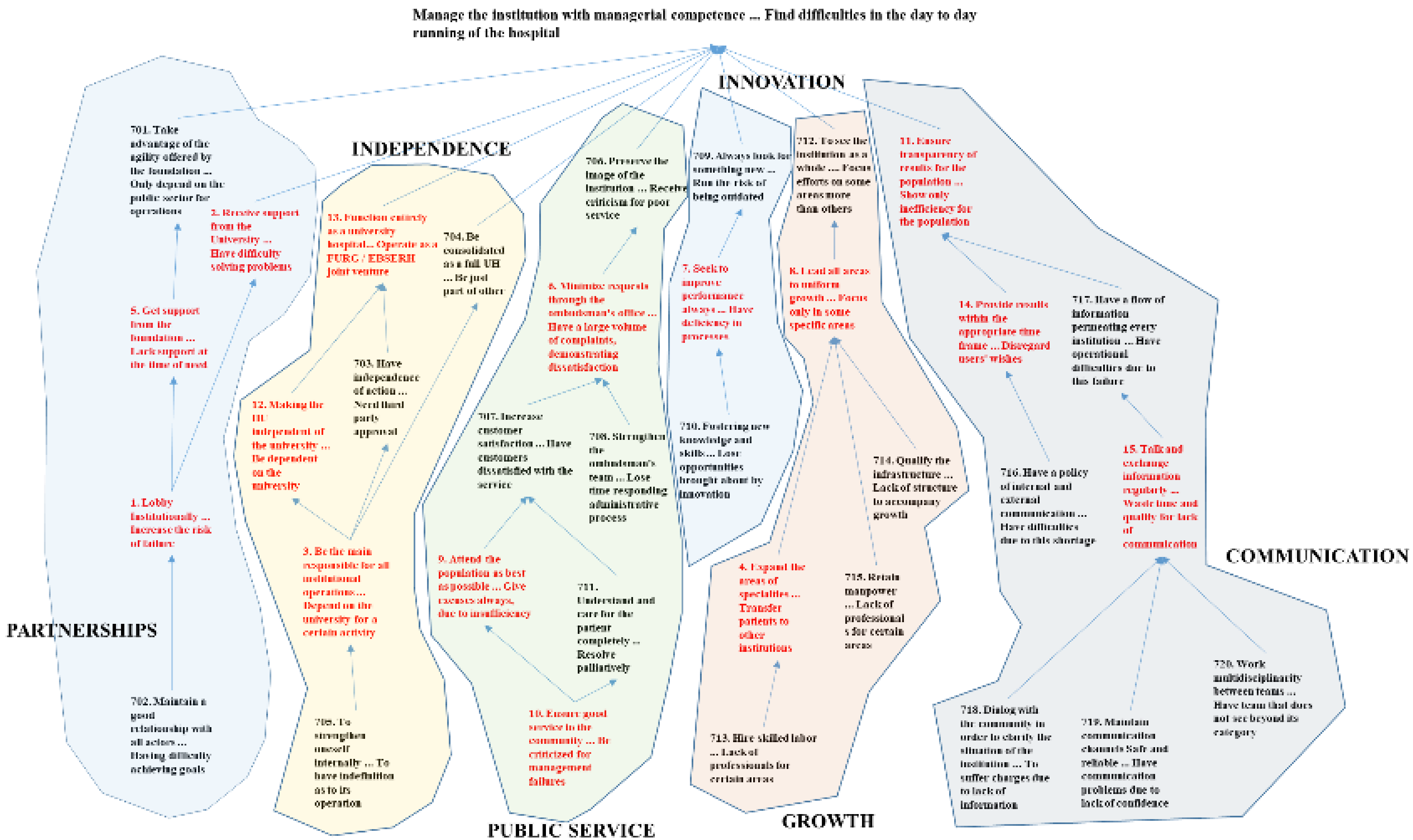

Operate in compliance with legal requirements ... Commit or act with irregularities
869. Correct deviations in hiring ... Subsidiarily answer for unfulfilled obligations
872. Avoid institutional exposure ... Have the image of the institution spotted
873. Avoid exposure of people ... Questioning the suitability of people
874. Provide accounts properly ... Return funds due to irregularities
868. Identify contractual problems ... Have delays or cancellations
877. Understand the limits of action of the agents ... Commit impropriety in the exercise of duty
75. Work with compliance with current legislation ... Have accountability problems
76a. Ensure the correct supervision of the contract with the contractor ... demonstrate ignorance to the supervisory bodies
76b. Ensure the correct supervision of the contract with the contracted company ... not cause loss to the public coffers
876. Know the legislation that aims at the exercise of the profession ... Not knowing the laws that govern the operations
870. Qualify teams regarding compliance with legislation ... Face legal setbacks
871. Attempt to constantly changing legislation ... Being outdated in operations
867. Develop an administrative operational support sector ... Lack of legal administrative support
875. Have an active legal sector ... Not aware of changes in legislation

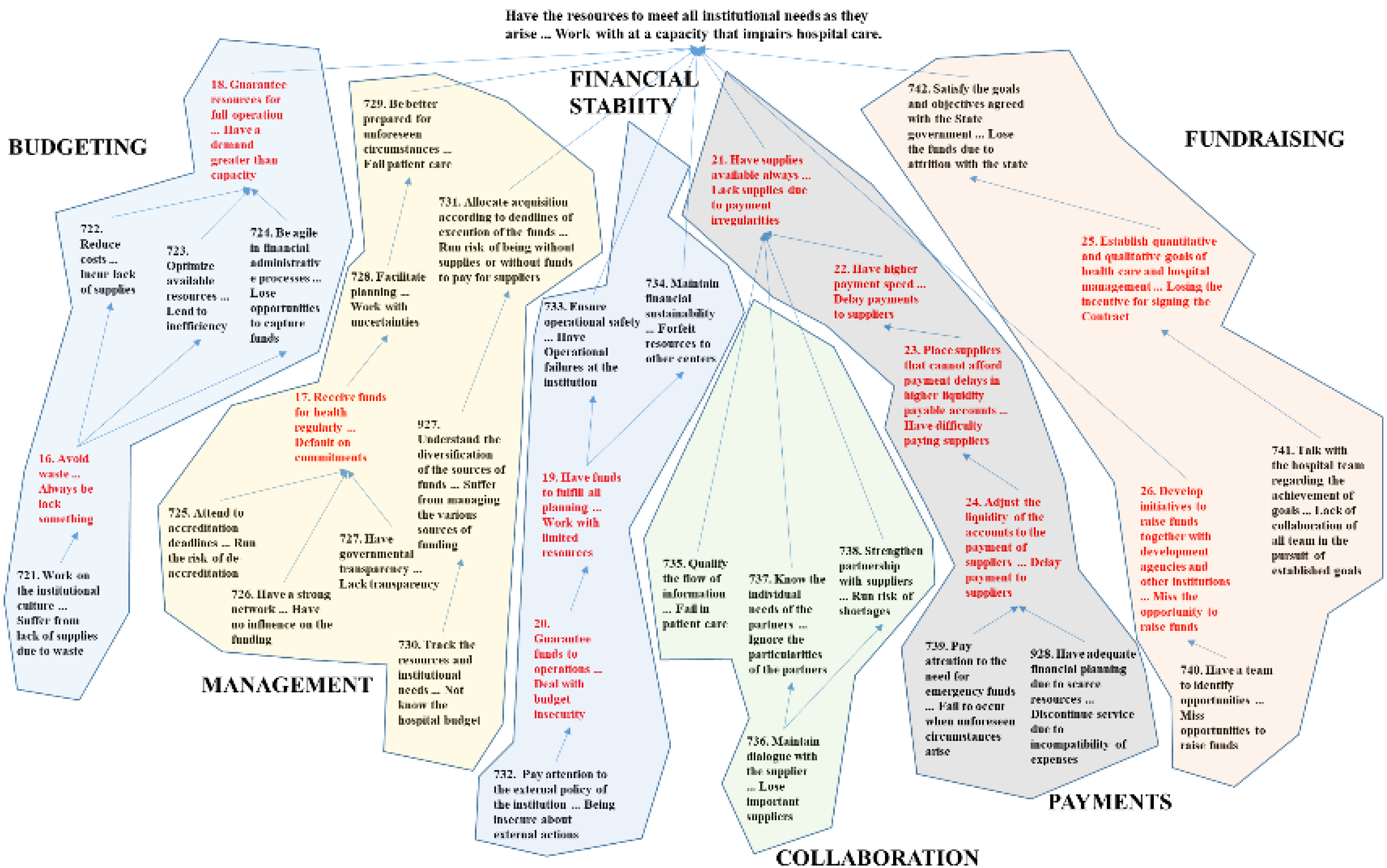

Establish adequate strategic planning of hospital needs in all dimensions ... Always work without any planning
81. Have measurable and objective goals ... Have a disjointed planning
82. Have adequate workforce for smooth operation ... Overload some sector
80. Have the predictability of the entire bidding process ... Difficulty predicting the timing for purchases
880. Plan the infrastructure to ensure smooth operations ... Provide precarious work
879. Have medium-term vision. Always resolve emergencies
882. Align strategic planning and operational planning ... Work fragmentally
83. Ensure that the need for hiring is planned in a timely manner ... Have the service discontinued due to failure to plan the process
79. Align actions to the institutional strategic development plan ... Work disjointedly
77. Prioritize planning as culture ... Suffer from shortage of supplies and equipment
78. Learn from past mistakes ... repeat the same past difficulties
881. Develop the culture of institutional planning ... Be devoid of planning actions



Manage human capital to achieve organizational goals ... Fail to manage people correctly

APPENDIX C: CLUSTERS AND LINES OF ARGUMENTATION BY AREA OF CONCERN




Have the resources to meet all institutional needs as they arise ... Work with at a capacity that impairs hospital care.
FINANCIAL STABIITY
BUDGETING
18. Guarantee resources for full operation ... Have a demand greater than capacity
722. Reduce costs ... Incur lack of supplies
723. Optimize available resources ... Lead to inefficiency
724. Be agile in financial administrative processes ... Lose opportunities to capture funds
16. Avoid waste ... Always be lack something
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729. Be better prepared for unforeseen circumstances ... Fail patient care
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725. Attend to accreditation deadlines ... Run the risk of de accreditation
727. Have governmental transparency ... Lack transparency
726. Have a strong network ... Have no influence on the funding
730. Track the resources and institutional needs ... Not know the hospital budget
MANAGEMENT
733. Ensure operational safety ... Have Operational failures at the institution
734. Maintain financial sustainability ... Forfeit resources to other centers
19. Have funds to fulfill all planning ... Work with limited resources
20. Guarantee funds to operations ... Deal with budget insecurity
732. Pay attention to the external policy of the institution ... Being insecure about external actions
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737. Know the individual needs of the partners ... Ignore the particularities of the partners
738. Strengthen partnership with suppliers ... Run risk of shortages
736. Maintain dialogue with the supplier ... Lose important suppliers
COLLABORATION
739. Pay attention to the need for emergency funds ... Fail to occur when unforeseen circumstances arise
928. Have adequate financial planning due to scarce resources ... Discontinue service due to incompatibility of expenses
PAYMENTS
742. Satisfy the goals and objectives agreed with the State government ... Lose the funds due to attrition with the state
FUNDRAISING
25. Establish quantitative and qualitative goals of health care and hospital management ... Losing the incentive for signing the Contract
26. Develop initiatives to raise funds together with development agencies and other institutions ... Miss the opportunity to raise funds
741. Talk with the hospital team regarding the achievement of goals ... Lack of collaboration of all team in the pursuit of established goals
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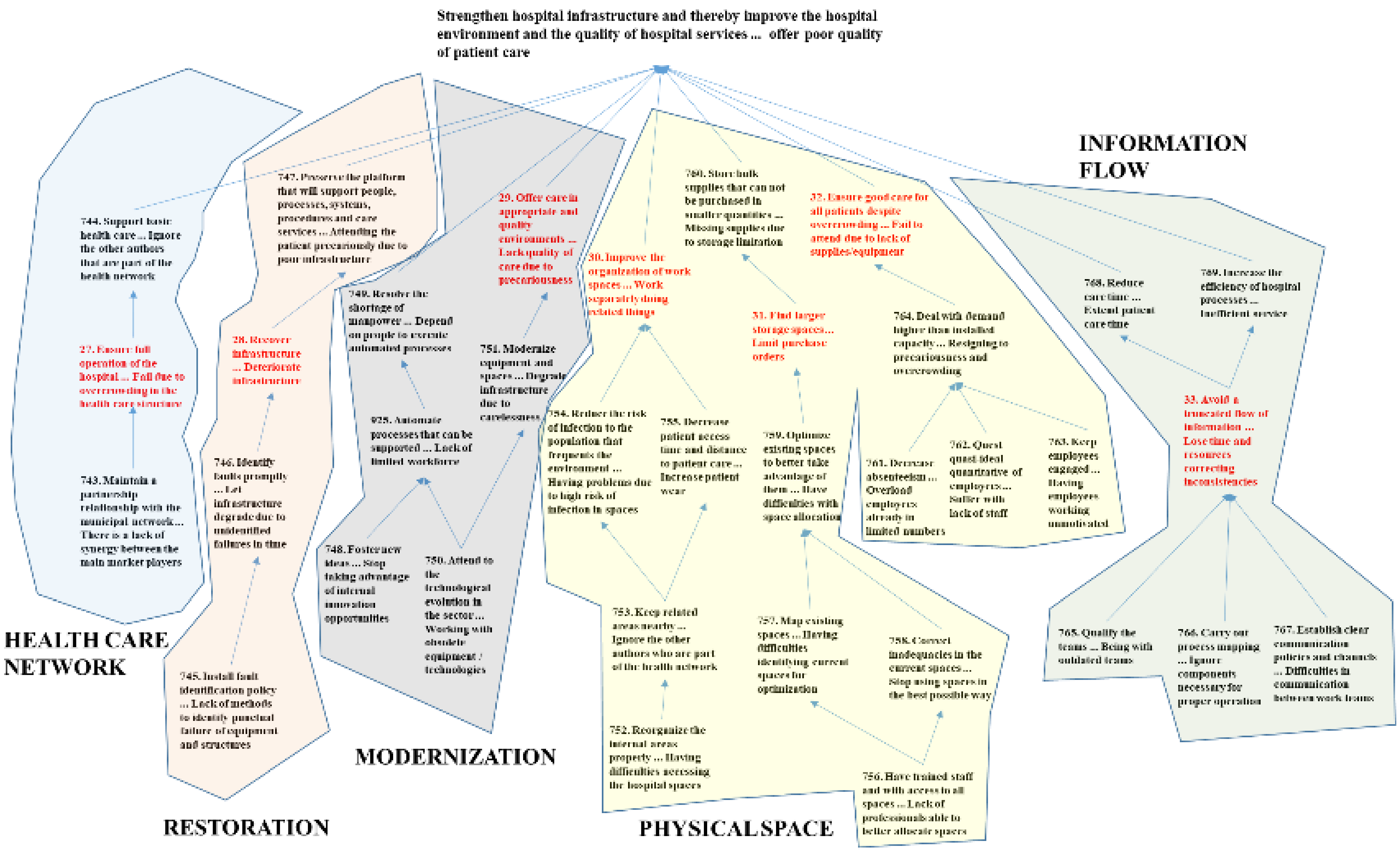
Strengthen hospital infrastructure and thereby improve the hospital environment and the quality of hospital services ... offer poor quality of patient care
744. Support basic health care ... Ignore the other authors that are part of the health network
27. Ensure full operation of the hospital ... Fail due to overcrowding in the health care structure
743. Maintain a partnership relationship with the municipal network... There is a lack of synergy between the main market players
HEALTH CARE NETWORK
747. Preserve the platform that will support people, processes, systems, procedures and care services ... Attending the patient precariously due to poor infrastructure
28. Recover infrastructure ... Deteriorate infrastructure
746. Identify faults promptly ... Let infrastructure degrade due to unidentified failures in time
745. Install fault identification policy ... Lack of methods to identify punctual failure of equipment and structures
RESTORATION
749. Resolve the shortage of manpower ... Depend on people to execute automated processes
29. Offer care in appropriate and quality environments ... Lack quality of care due to precariousness
751. Moderaize equipment and spaces ... Degrade infrastructure due to carelessness
925. Automate processes that can be supported ... Lack of limited workforce
748. Foster new ideas ... Stop taking advantage of internal innovation opportunities
750. Attend to the technological evolution in the sector ... Working with obsolete equipment / technologies
MODERNIZATION
30. Improve the organization of work spaces ... Work separately doing related things
760. Store bulk supplies that can not be purchased in smaller quantities ... Missing supplies due to storage limitation
32. Ensure good care for all patients despite overcrowding ... Fail to attend due to lack of supplies/equipment
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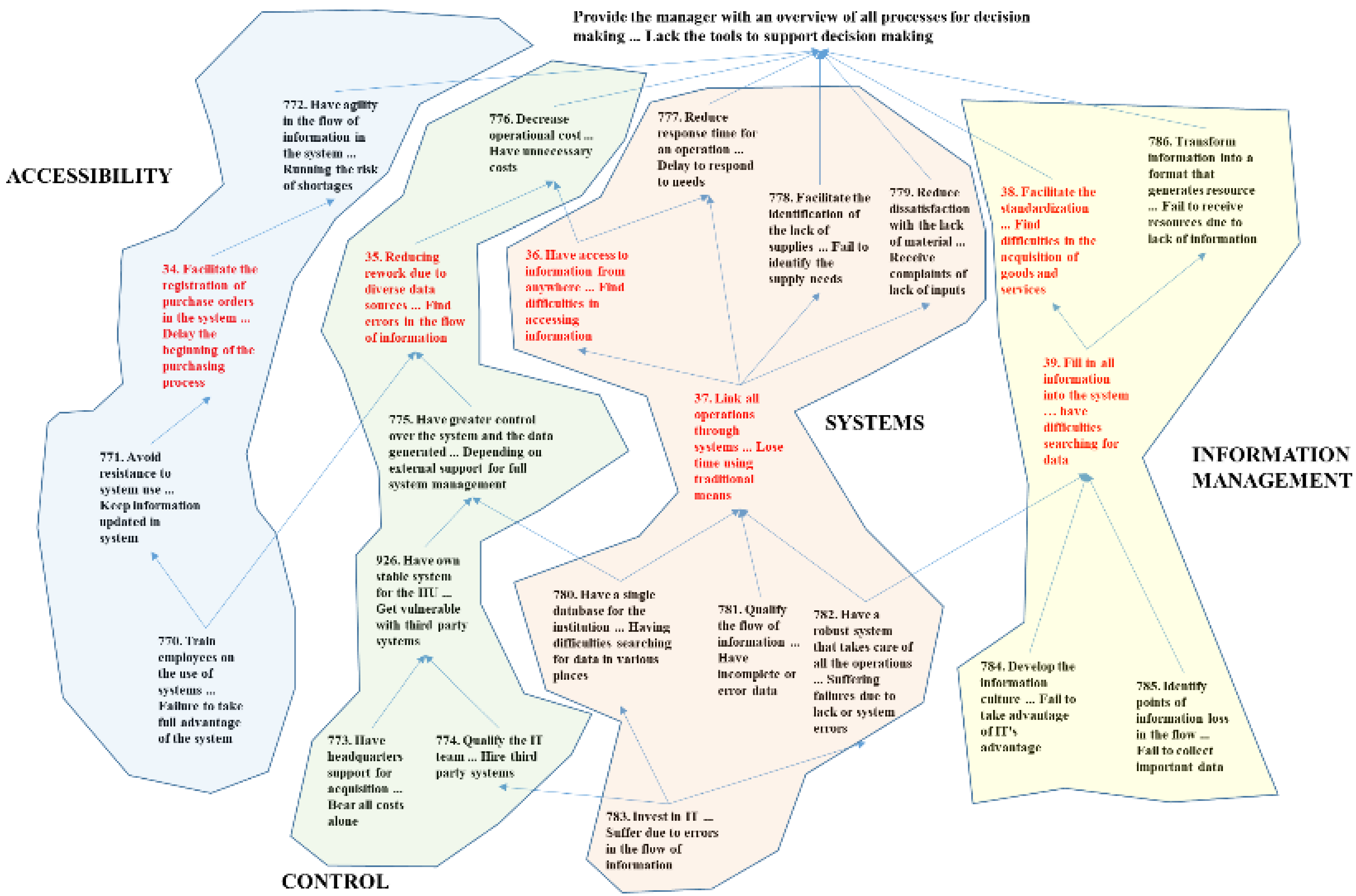
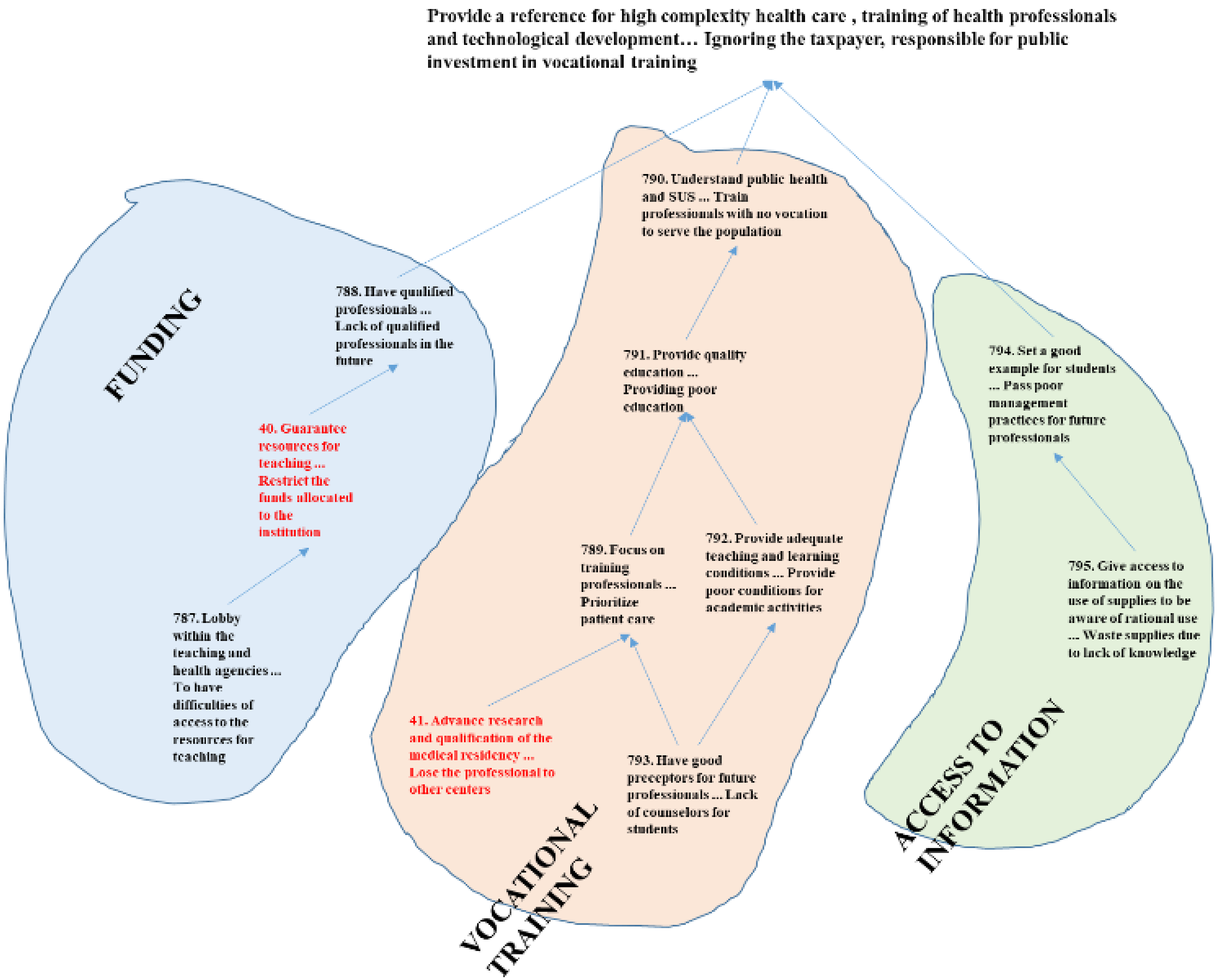
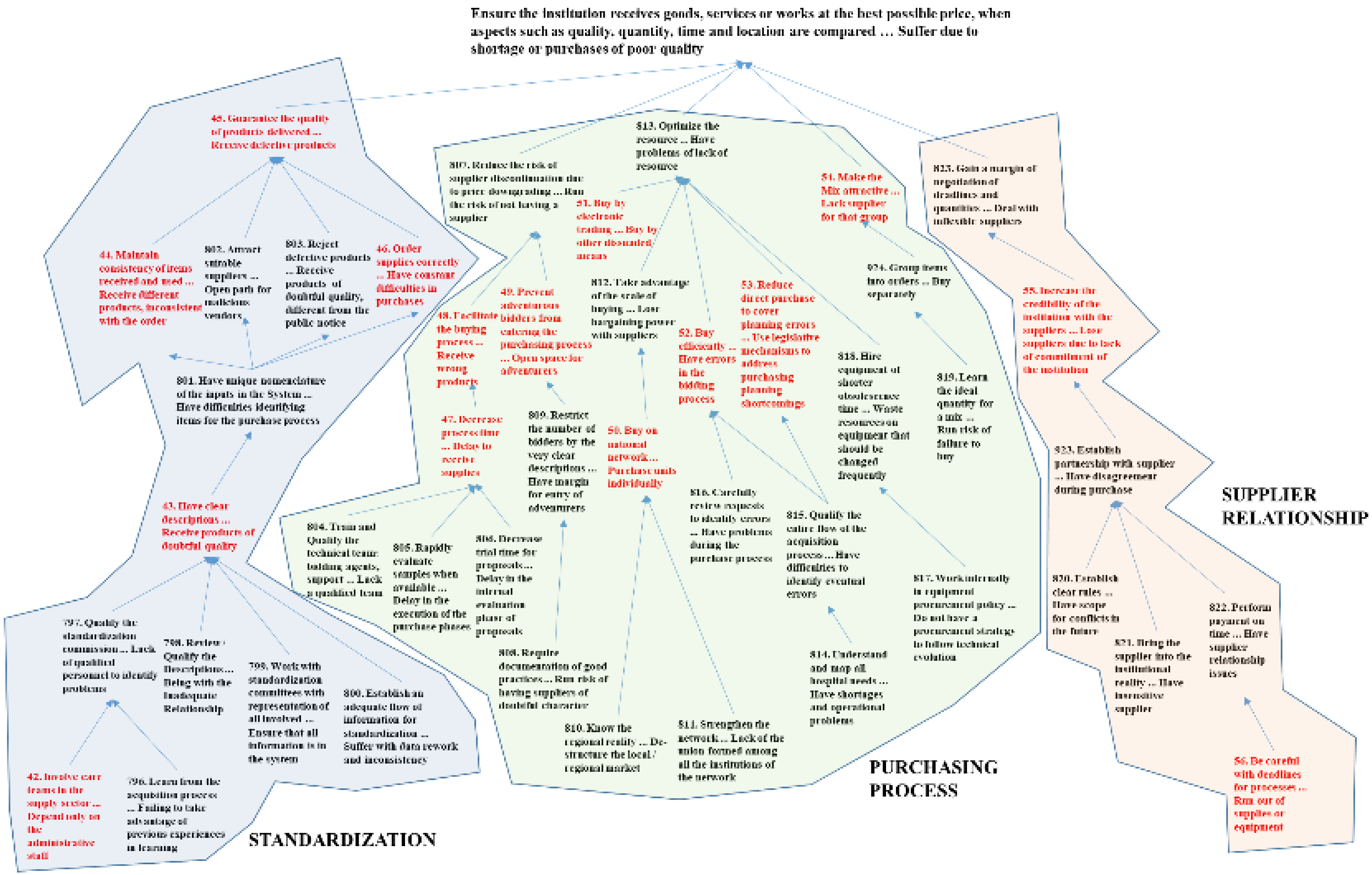
758. Correct inadequacies in the current spaces ... Stop using spaces in the best possible way
752. Reorganize the internal areas properly ... Having difficulties accessing the hospital spaces
756. Have trained staff and with access in all spaces ... Lack of professionals able to better allocate spaces
PHYSICALSPACE
INFORMATION FLOW
768. Reduce care time ... Extend patient care time
769. Increase the efficiency of hospital processes ... Inefficient service
33. Avoid a truncated flow of information ... Lose time and resources correcting inconsistencies
765. Qualify the teams ... Being with outdated teams
766. Carry out process mapping ... Ignore components necessary for proper operation
767. Establish clear communication policies and channels ... Difficulties in communication between work teams



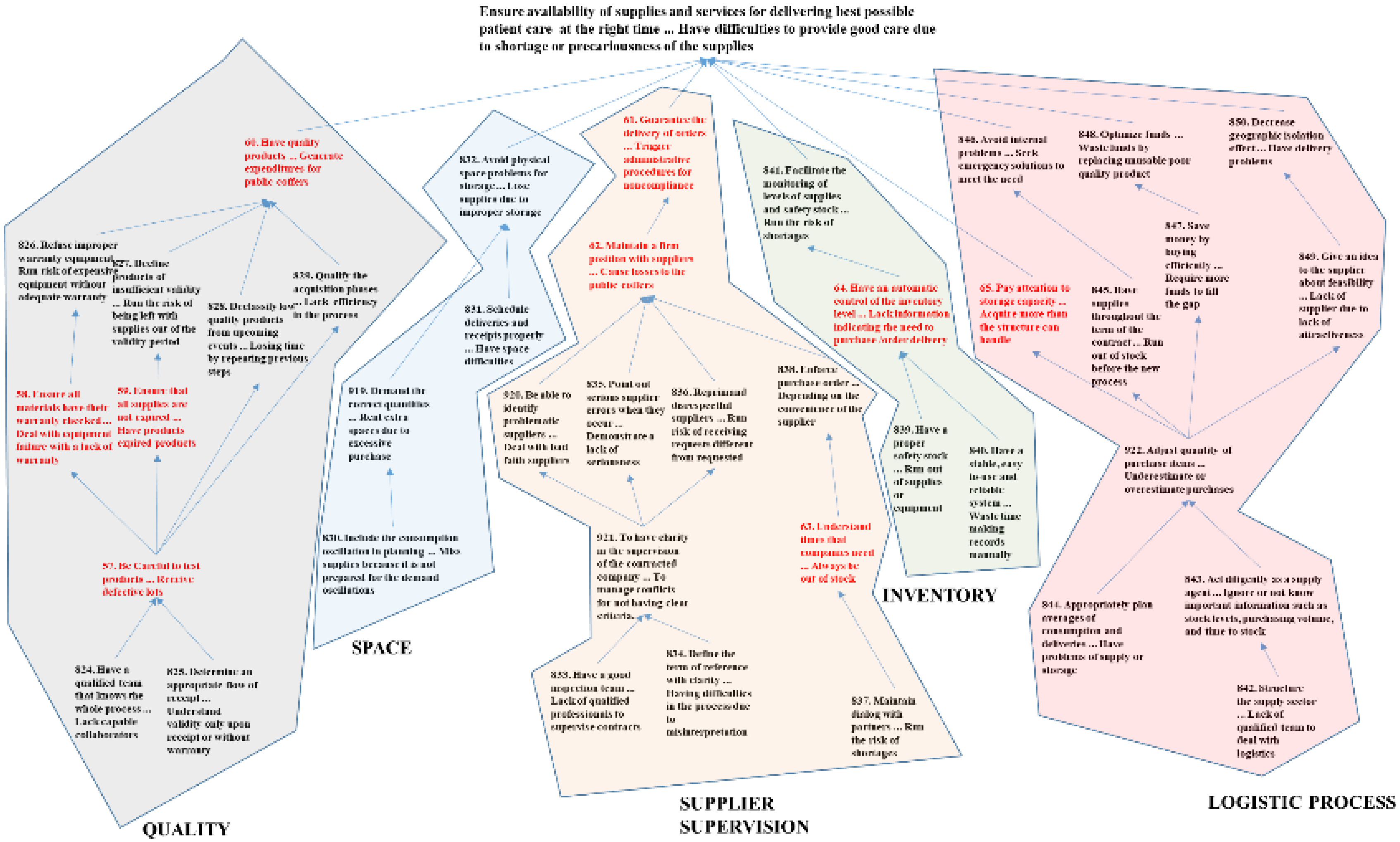
Provide the manager with an overview of all processes for decision making ... Lack the tools to support decision making
ACCESSIBILITY
772. Have agility in the flow of information in the system ... Running the risk of shortages
34. Facilitate the registration of purchase orders in the system ... Delay the beginning of the purchasing process
771. Avoid resistance to system use ... Keep information updated in system
770. Train employees on the use of systems ... Failure to take full advantage of the system
776. Decrease operational cost ... Have unnecessary costs
35. Reducing rework due to diverse data sources ... Find errors in the flow of information
775. Have greater control over the system and the data generated ... Depending on external support for full system management
926. Have own stable system for the HU ... Get vulnerable with third party systems
773. Have headquarters support for acquisition ... Bear all costs alone
774. Qualify the IT team ... Hire third party systems
CONTROL
777. Reduce response time for an operation ... Delay to respond to needs
778. Facilitate the identification of the lack of supplies ... Fail to identify the supply needs
779. Reduce dissatisfaction with the lack of material ... Receive complaints of lack of inputs
36. Have access to information from anywhere ... Find difficulties in accessing information
37. Link all operations through systems ... Lose time using traditional means
SYSTEMS
780. Have a single database for the institution ... Having difficulties searching for data in various places
781. Qualify the flow of information ... Have incomplete or error data
782. Have a robust system that takes care of all the operations ... Suffering failures due to lack or system errors
783. Invest in IT ... Suffer due to errors in the flow of information
38. Facilitate the standardization ... Find difficulties in the acquisition of goods and services
786. Transform information into a format that generates resource ... Fail to receive resources due to lack of information
39. Fill in all information into the system ... have difficulties searching for data
INFORMATION MANAGEMENT
784. Develop the information culture ... Fail to take advantage of IT's advantage
785. Identify points of information loss in the flow ... Fail to collect important data

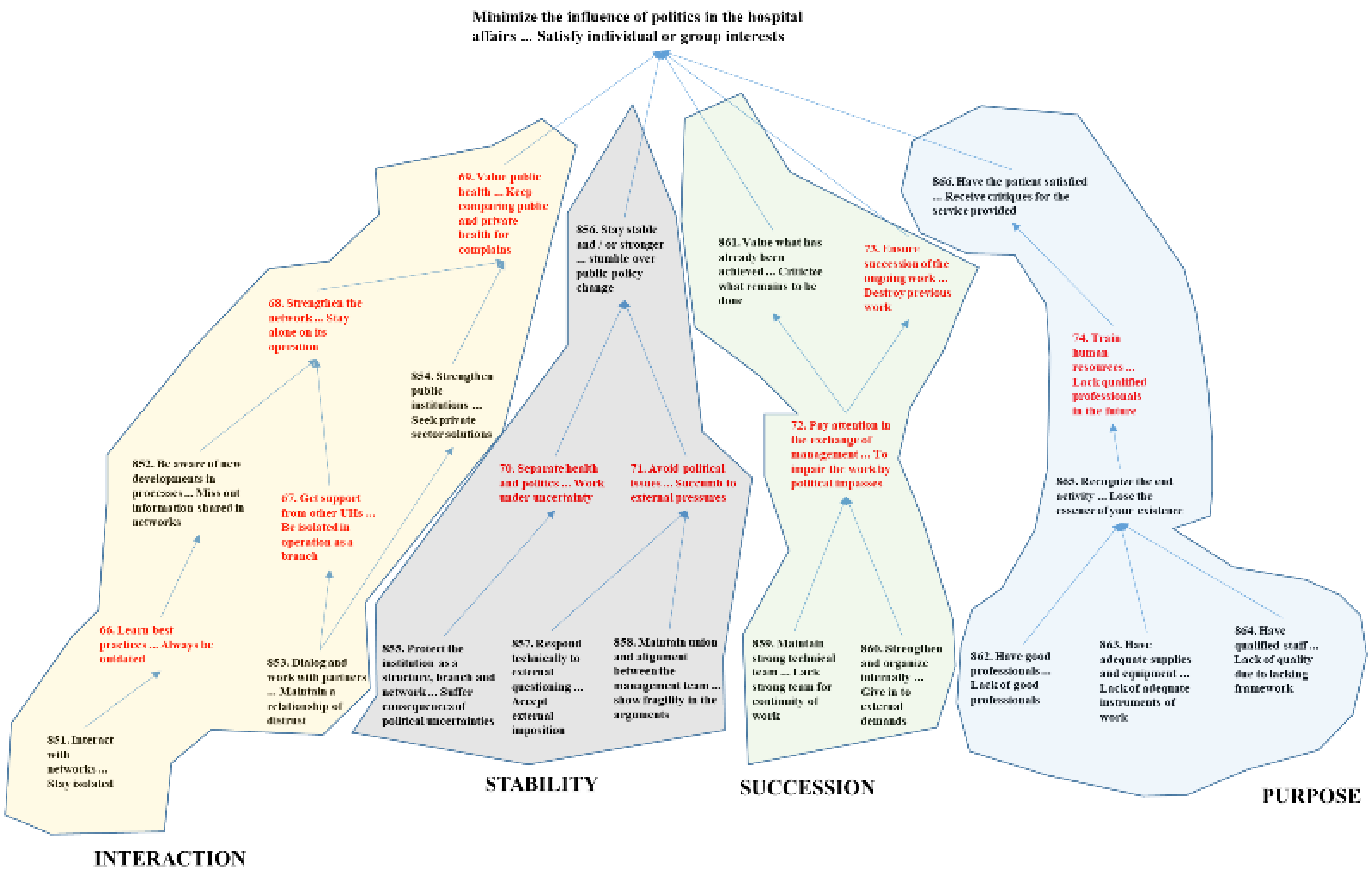


Provide a reference for high complexity health care , training of health professionals and technological development… Ignoring the taxpayer, responsible for public investment in vocational training
FUNDING
788. Have qualified professionals ... Lack of qualified professionals in the future
40. Guarantee resources for teaching ... Restrict the funds allocated to the institution
787. Lobby within the teaching and health agencies ... To have difficulties of access to the resources for teaching
790. Understand public health and SUS ... Train professionals with no vocation to serve the population
791. Provide quality education ... Providing poor education
789. Focus on training professionals ... Prioritize patient care
792. Provide adequate teaching and learning conditions ... Provide poor conditions for academic activities
41. Advance research and qualification of the medical residency ... Lose the professional to other centers
793. Have good preceptors for future professionals ... Lack of counselors for students
VOCATIONAL TRAINING
794. Set a good example for students ... Pass poor management practices for future professionals
795. Give access to information on the use of supplies to be aware of rational use ... Waste supplies due to lack of knowledge
ACCESS TO INFORMATION

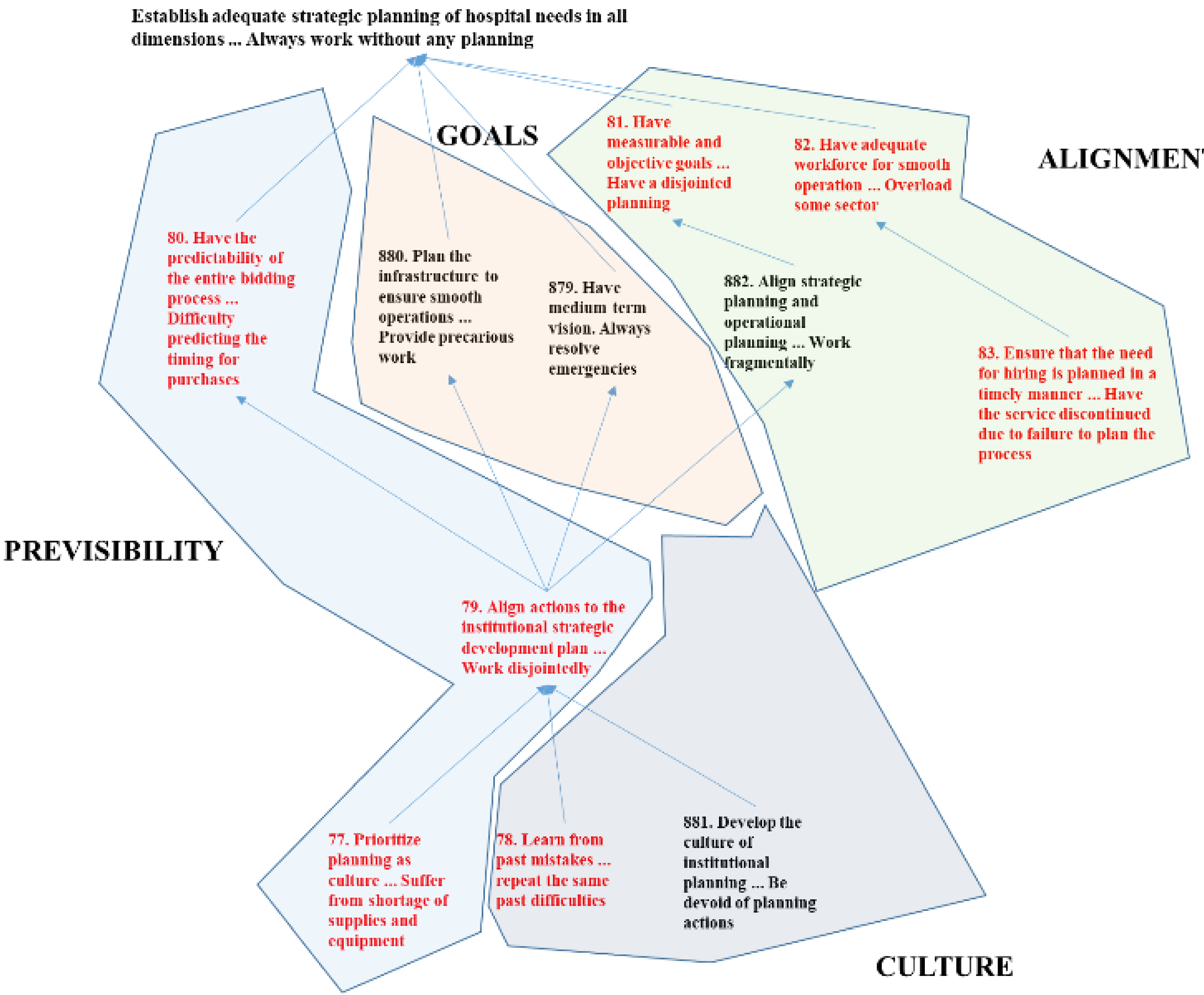


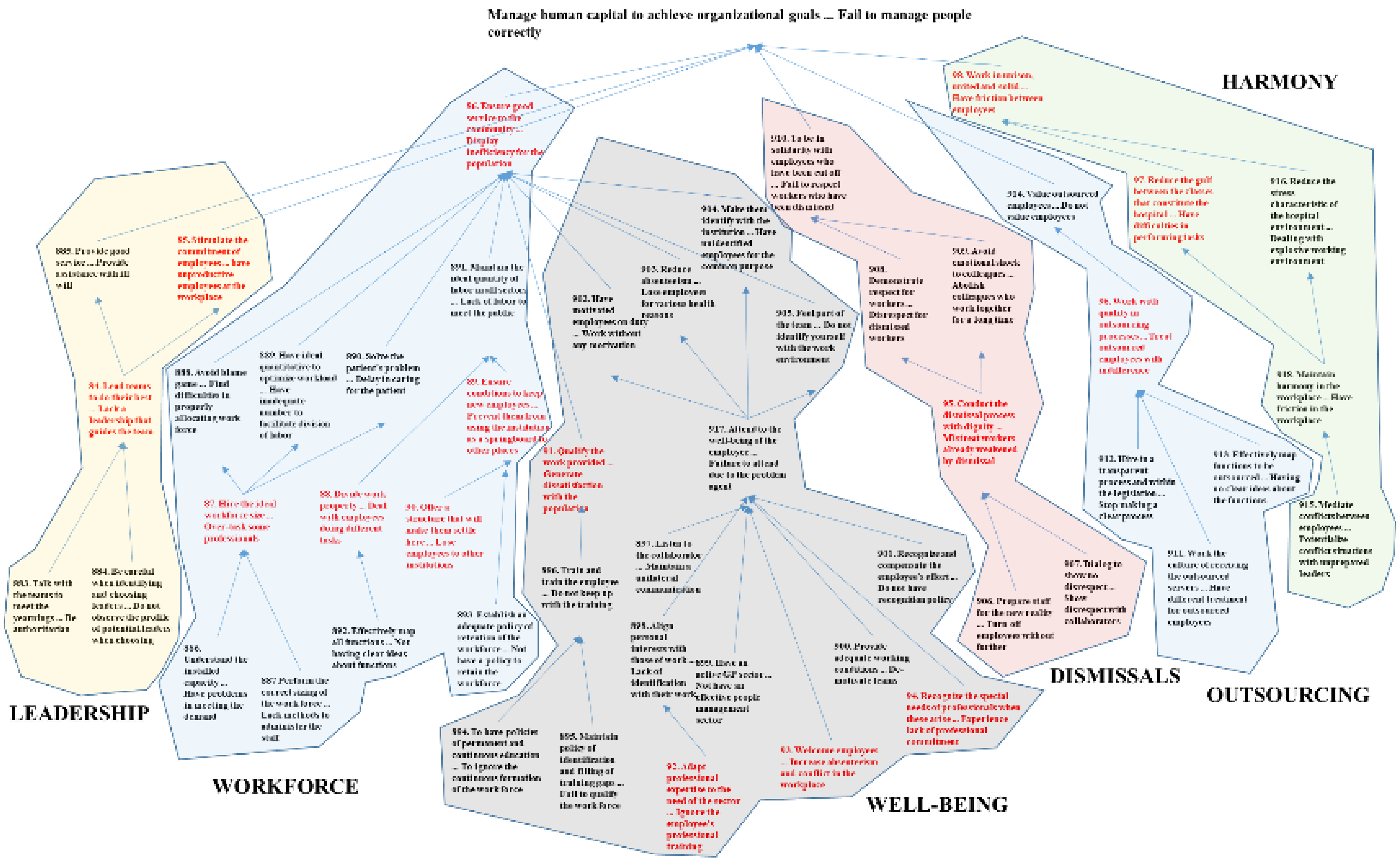
Ensure the institution receives goods, services or works at the best possible price, when aspects such as quality, quantity, time and location are compared … Suffer due to shortage or purchases of poor quality
45. Guarantee the quality of products delivered ... Receive defective products
44. Maintain consistency of items received and used ... Receive different products, inconsistent with the order
802. Attract suitable suppliers ... Open path for malicious vendors
803. Reject defective products ... Receive products of doubtful quality, different from the public notice
46. Order supplies correctly ... Have constant difficulties in purchases
801. Have unique nomenclature of the inputs in the System ... Have difficulties identifying items for the purchase process
43. Have clear descriptions ... Receive products of doubtful quality
797. Qualify the standardization commission ... Lack of qualified personnel to identify problems
798. Review / Qualify the Descriptions ... Being with the Inadequate Relationship
799. Work with standardization committees with representation of all involved ... Ensure that all information is in the system
800. Establish an adequate flow of information for standardization ... Suffer with data rework and inconsistency
42. Involve care teams in the supply sector ... Depend only on the administrative staff
796. Learn from the acquisition process ... Failing to take advantage of previous experiences in learning
STANDARDIZATION
813. Optimize the resource ... Have problems of lack of resource
807. Reduce the risk of supplier discontinuation due to price downgrading ... Run the risk of not having a supplier
51. Buy by electronic trading ... Buy by other discarded means
54. Make the Mix attractive ... Lack supplier for that group
48. Facilitate the buying process ... Receive wrong products
49. Prevent adventurous bidders from entering the purchasing process ... Open space for adventurers
812. Take advantage of the scale of buying ... Lose bargaining power with suppliers
52. Buy efficiently ... Have errors in the bidding process
53. Reduce direct purchase to cover planning errors ... Use legislative mechanisms to address purchasing planning shortcomings
824. Group items into orders ... Buy separately
818. Hire equipment of shorter obsolescence time ... Waste resources on equipment that should be changed frequently
819. Learn the ideal quantity for a mix ... Run risk of failure to buy
47. Decrease process time ... Delay to receive supplies
809. Restrict the number of bidders by the very clear descriptions ... Have margin for entry of adventurers
50. Buy on national network... Purchase units individually
816. Carefully review requests to identify errors ... Have problems during the purchase process
815. Qualify the entire flow of the acquisition process ... Have difficulties to identify eventual errors
804. Train and Qualify the technical team: bidding agents, support ... Lack a qualified team
805. Rapidly evaluate samples when available ... Delay in the execution of the purchase phases
806. Decrease trial time for proposals... Delay in the internal evaluation phase of proposals
817. Work internally in equipment procurement policy ... Do not have a procurement strategy to follow technical evolution
808. Require documentation of good practices ... Run risk of having suppliers of doubtful character
814. Understand and map all hospital needs ... Have shortages and operational problems
810. Know the regional reality ... De-structure the local / regional market
811. Strengthen the network... Lack of the union formed among all the institutions of the network
PURCHASING PROCESS
825. Gain a margin of negotiation of deadlines and quantities ... Deal with inflexible suppliers
55. Increase the credibility of the institution with the suppliers ... Lose suppliers due to lack of commitment of the institution
823. Establish partnership with supplier ... Have disagreement during purchase
SUPPLIER RELATIONSHIP
820. Establish clear rules ... Have scope for conflicts in the future
821. Bring the supplier into the institutional reality ... Have unreactive supplier
822. Perform payment on time ... Have supplier relationship issues
56. Be careful with deadlines for processes ... Run out of supplies or equipment


Ensure availability of supplies and services for delivering best possible patient care at the right time ... Have difficulties to provide good care due to shortage or precariousness of the supplies
60. Have quality products ... Generate expenditures for public coffers
826. Refuse improper warranty equipment ... Run risk of expensive equipment without adequate warranty
827. Decline products of insufficient validity ... Run the risk of being left with supplies out of the validity period
828. Decisively lost quality products from upcoming events ... Losing time by repeating previous steps
829. Qualify the acquisition phases ... Lack efficiency in the process
58. Ensure all materials have their warranty checked ... Deal with equipment failure with a lack of warranty
59. Ensure that all supplies are not expired ... Have products expired products
57. Be Careful to test products ... Receive defective lots
824. Have a qualified team that knows the whole process ... Lack capable collaborators
825. Determine an appropriate flow of receipt ... Understand validity only upon receipt or without warranty
QUALITY
832. Avoid physical space problems for storage ... Lose supplies due to improper storage
831. Schedule deliveries and receipts properly ... Have space difficulties
819. Demand the correct quantities ... Rent extra spaces due to excessive purchase
830. Include the consumption oscillation in planning ... Miss supplies because it is not prepared for the demand oscillations
SPACE
61. Guarantee the delivery of orders ... Trigger administrative procedures for noncompliance
62. Maintain a firm position with suppliers ... Cause losses to the public coffers
820. Be able to identify problematic suppliers ... Deal with bad faith suppliers
835. Point out serious supplier errors when they occur ... Demonstrate a lack of seriousness
836. Reprimand disrespectful suppliers ... Run risk of receiving requests different from requested
838. Enforce purchase order ... Depending on the convenience of the supplier
921. To have clarity in the supervision of the contracted company ... To manage conflicts for not having clear criteria.
63. Understand times that companies need ... Always be out of stock
833. Have a good inspection team ... Lack of qualified professionals to supervise contracts
834. Define the term of reference with clarity ... Having difficulties in the process due to misinterpretation
837. Maintain dialog with partners ... Run the risk of shortages
SUPPLIER SUPERVISION
841. Facilitate the monitoring of levels of supplies and safety stock ... Run the risk of shortages
64. Have an automatic control of the inventory level ... Lack information indicating the need to purchase /order delivery
839. Have a proper safety stock ... Run out of supplies or equipment
840. Have a stable, easy to-use and reliable system ... Waste time making records manually
INVENTORY
846. Avoid internal problems ... Seek emergency solutions to meet the need
848. Optimize funds ... Waste funds by replacing unusable poor quality product
850. Decrease geographic isolation effect ... Have delivery problems
847. Save money by buying efficiently ... Require more funds to fill the gap
849. Give an idea to the supplier about feasibility ... Lack of supplier due to lack of attractiveness
65. Pay attention to storage capacity ... Acquire more than the structure can handle
845. Have supplies throughout the term of the contract ... Run out of stock before the new process
922. Adjust quantity of purchase items ... Underestimate or overestimate purchases
844. Appropriately plan averages of consumption and deliveries ... Have problems of supply or storage
843. Act diligently as a supply agent ... Ignore or not know important information such as stock levels, purchasing volume, and time to stock
842. Structure the supply sector ... Lack of qualified team to deal with logistics
LOGISTIC PROCESS

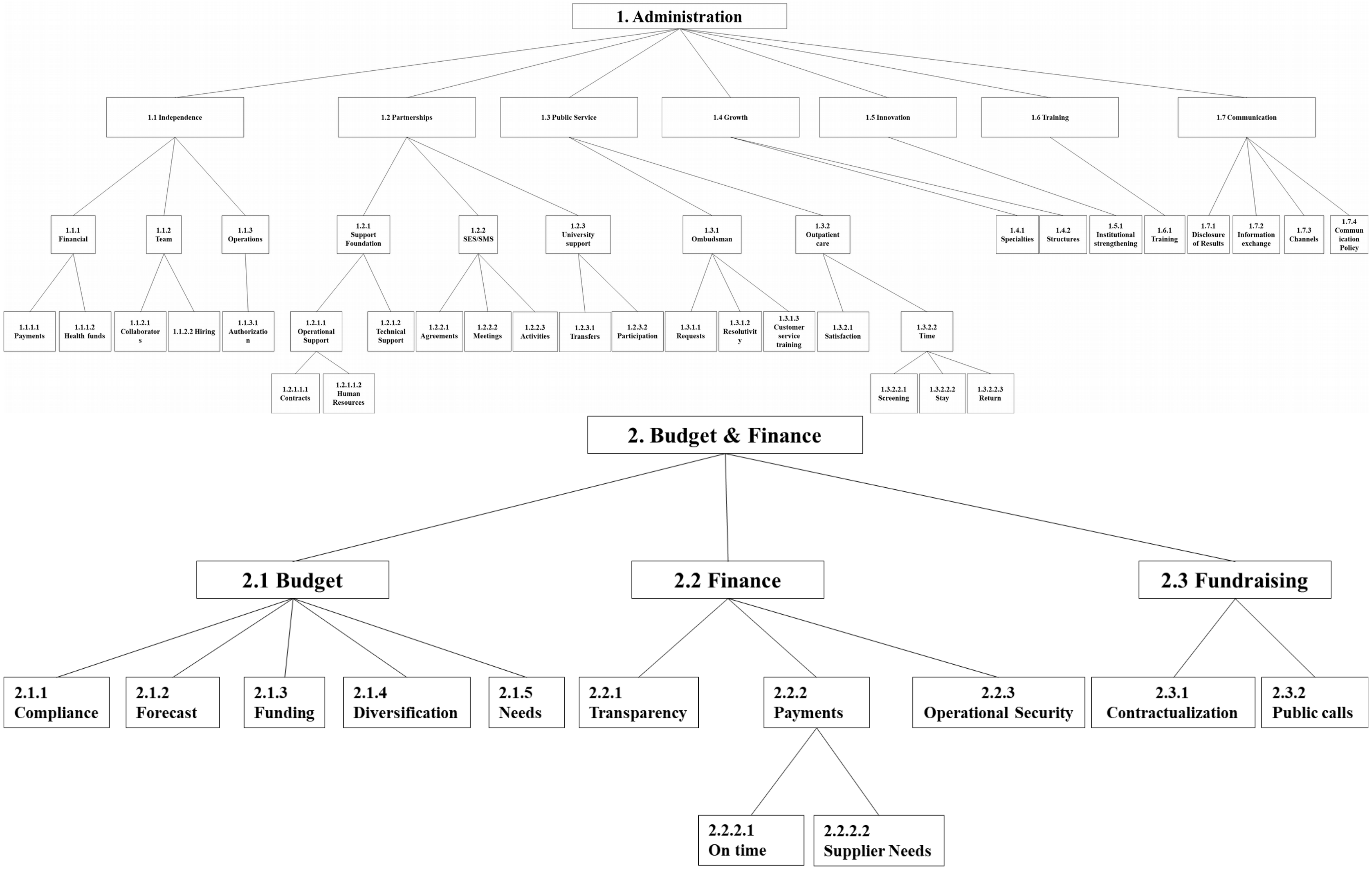

Minimize the influence of politics in the hospital affairs ... Satisfy individual or group interests
69. Valor public health ... Keep comparing public and private health for complains
68. Strengthen the network ... Stay alone on its operation
854. Strengthen public institutions ... Seek private sector solutions
852. Be aware of new developments in processes... Miss out information shared in networks
67. Get support from other UIIs ... Be isolated in operation as a branch
66. Learn best practices ... Always be outdated
853. Dialog and work with partners ... Maintain a relationship of distrust
851. Interact with networks ... Stay isolated
INTERACTION
856. Stay stable and / or stronger ... stumble over public policy change
70. Separate health and politics ... Work under uncertainty
71. Avoid political issues ... Succumb to external pressures
855. Protect the institution as a structure, branch and network... Suffer consequences of political uncertainties
857. Respond technically to external questioning ... Accept external imposition
858. Maintain union and alignment between the management team ... show fragility in the arguments
STABILITY
861. Value what has already been achieved ... Criticize what remains to be done
73. Ensure succession of the ongoing work ... Destroy previous work
72. Pay attention in the exchange of management ... To impair the work by political impasses
859. Maintain strong technical team ... Lack strong team for continuity of work
860. Strengthen and organize internally ... Give in to external demands
SUCCESSION
866. Have the patient satisfied ... Receive critiques for the service provided
74. Train human resources ... Lack qualified professionals in the future
865. Recognize the end activity ... Lose the essence of your existence
862. Have good professionals ... Lack of good professionals
863. Have adequate supplies and equipment ... Lack of adequate instruments of work
864. Have qualified staff ... Lack of quality due to lacking framework
PURPOSE

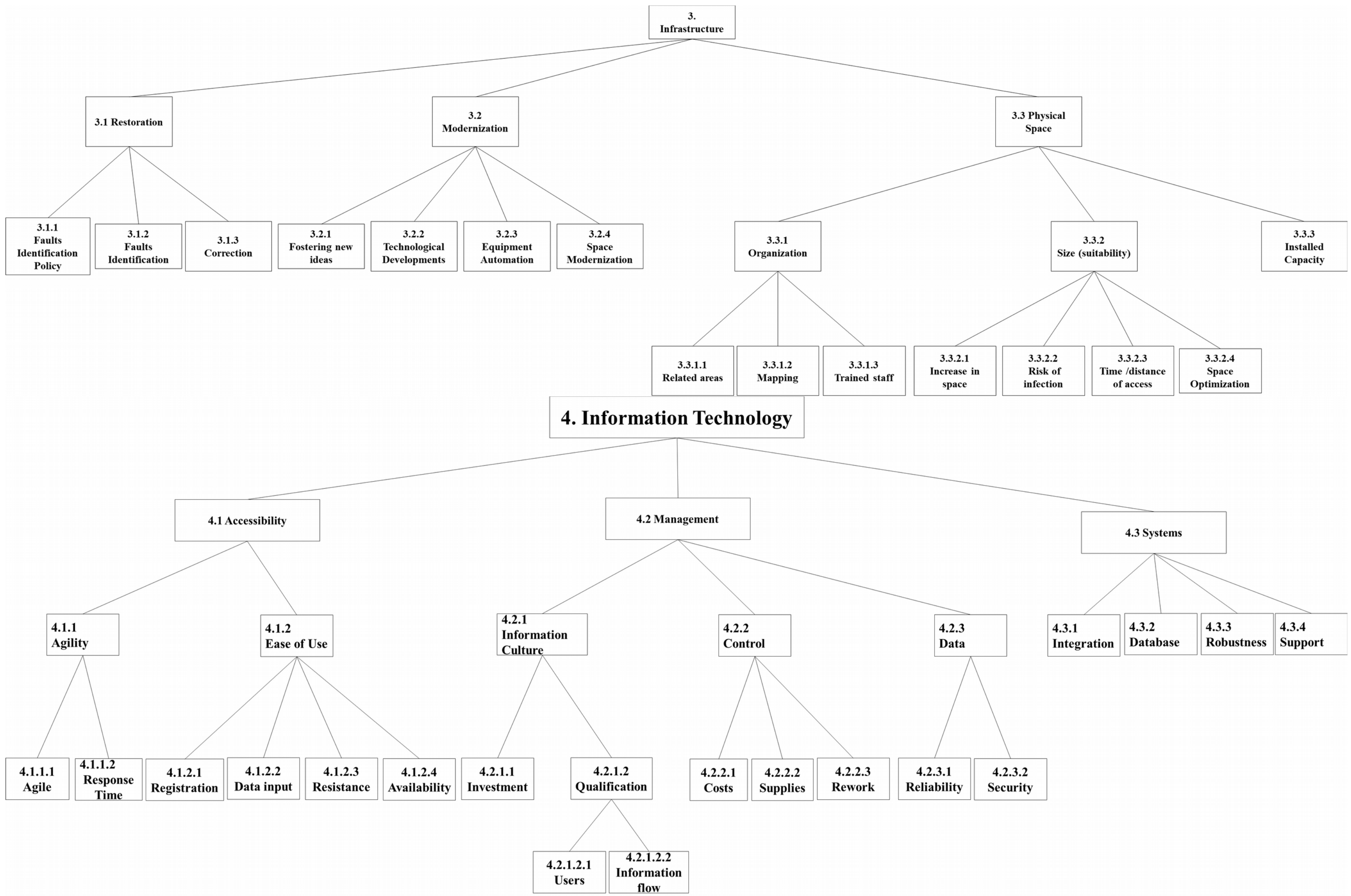
Operate in compliance with legal requirements ... Commit or act with irregularities
CONTRACTS
869. Correct deviations in hiring ... Subsidiarily answer for unfulfilled obligations
868. Identify contractual problems ... Have delays or cancellations
76b. Ensure the correct supervision of the contract with the contracted company ... not cause loss to the public coffers
76a. Ensure the correct supervision of the contract with the contractor ... demonstrate ignorance to the supervisory bodies
867. Develop an administrative operational support sector ... Lack of legal administrative support
872. Avoid institutional exposure ... Have the image of the institution spotted
873. Avoid exposure of people ... Questioning the suitability of people
874. Provide accounts properly ... Return funds due to irregularities
75. Work with compliance with current legislation ... Have accountability problems
870. Qualify teams regarding compliance with legislation ... Face legal setbacks
871. Attempt to constantly changing legislation ... Being outdated in operations
COMPLIANCE
877. Understand the limits of action of the agents ... Commit impropriety in the exercise of duty
876. Know the legislation that aims at the exercise of the profession ... Not knowing the laws that govern the operations
875. Have an active legal sector ... Not aware of changes in legislation
TECHNICAL-JURIDICAL

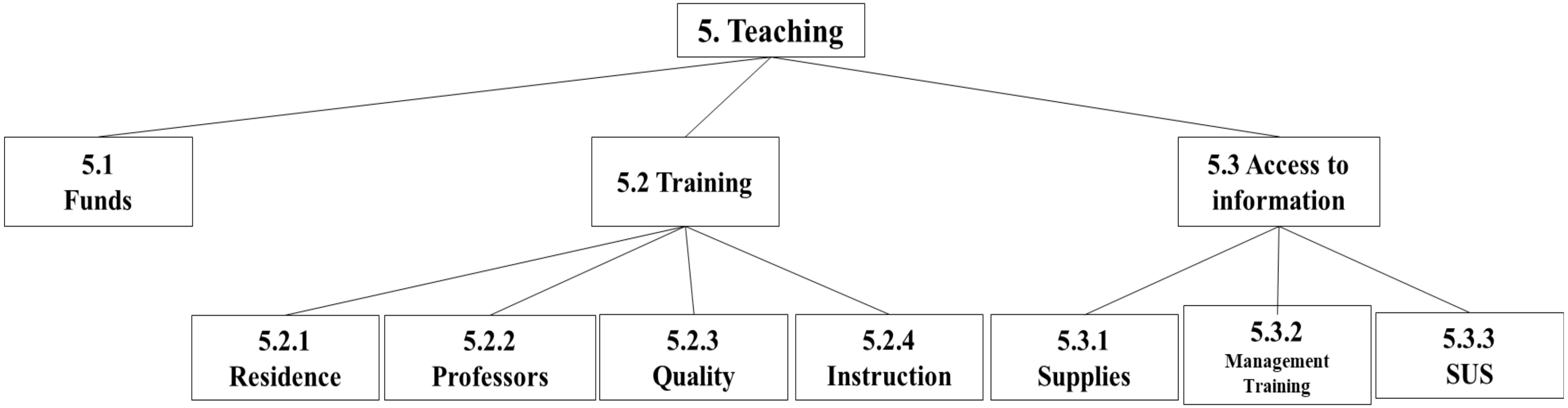

Establish adequate strategic planning of hospital needs in all dimensions ... Always work without any planning
GOALS
ALIGNMENT
81. Have measurable and objective goals ... Have a disjointed planning
82. Have adequate workforce for smooth operation ... Overload some sector
80. Have the predictability of the entire bidding process ... Difficulty predicting the timing for purchases
880. Plan the infrastructure to ensure smooth operations ... Provide precarious work
879. Have medium term vision. Always resolve emergencies
882. Align strategic planning and operational planning ... Work fragmentally
83. Ensure that the need for hiring is planned in a timely manner ... Have the service discontinued due to failure to plan the process
PREVISIBILITY
79. Align actions to the institutional strategic development plan ... Work disjointedly
77. Prioritize planning as culture ... Suffer from shortage of supplies and equipment
78. Learn from past mistakes ... repeat the same past difficulties
881. Develop the culture of institutional planning ... Be devoid of planning actions
CULTURE

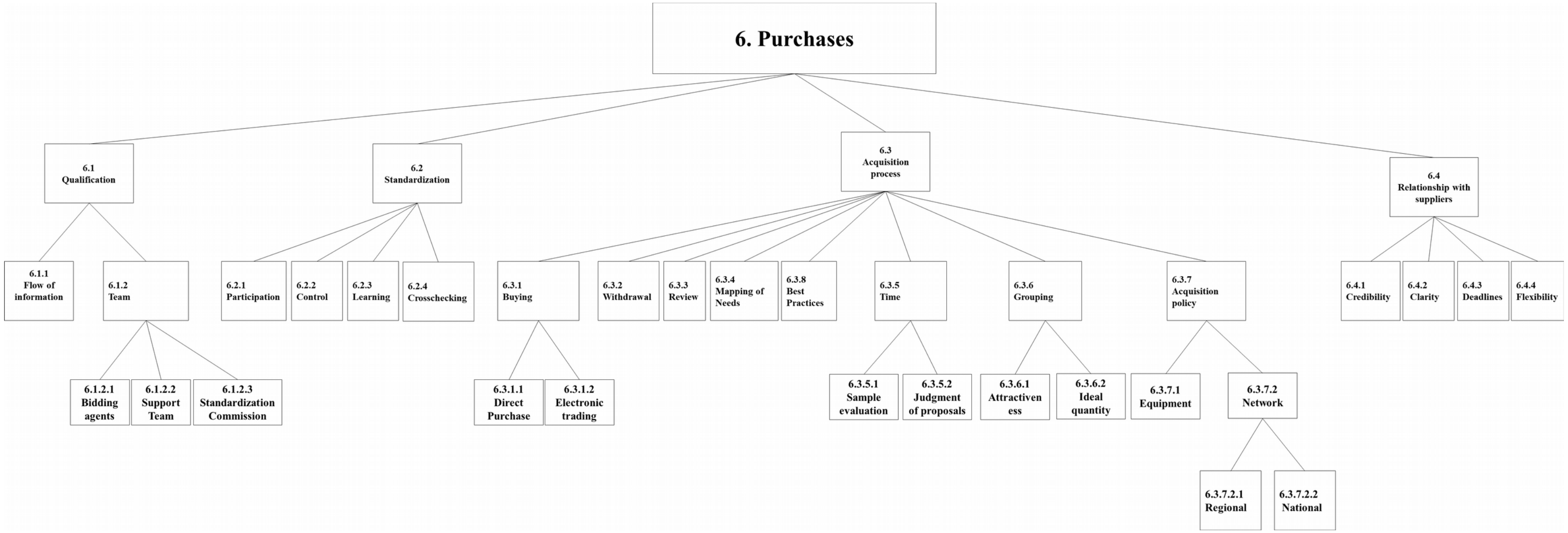

Manage human capital to achieve organizational goals ... Fail to manage people correctly
HARMONY
LEADERSHIP
WORKFORCE
WELL-BEING
DISMISSALS
OUTSOURCING

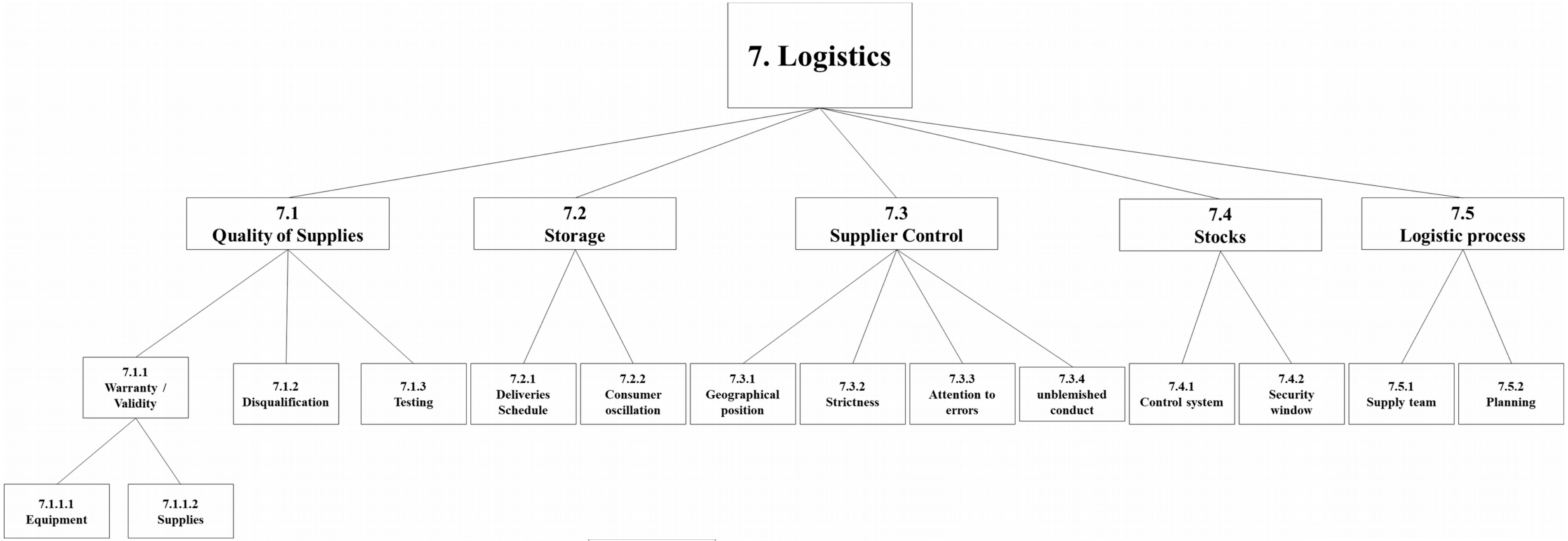
APPENDIX D: HIERARCHICAL STRUCTURE OF VALUE BY AREA OF CONCERN

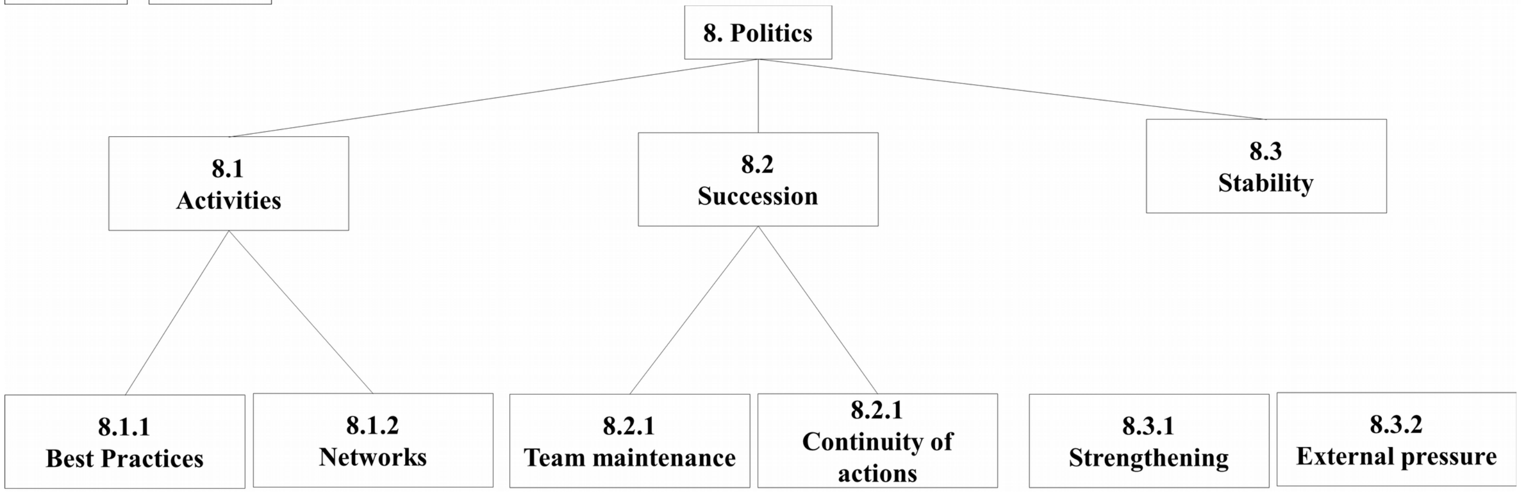


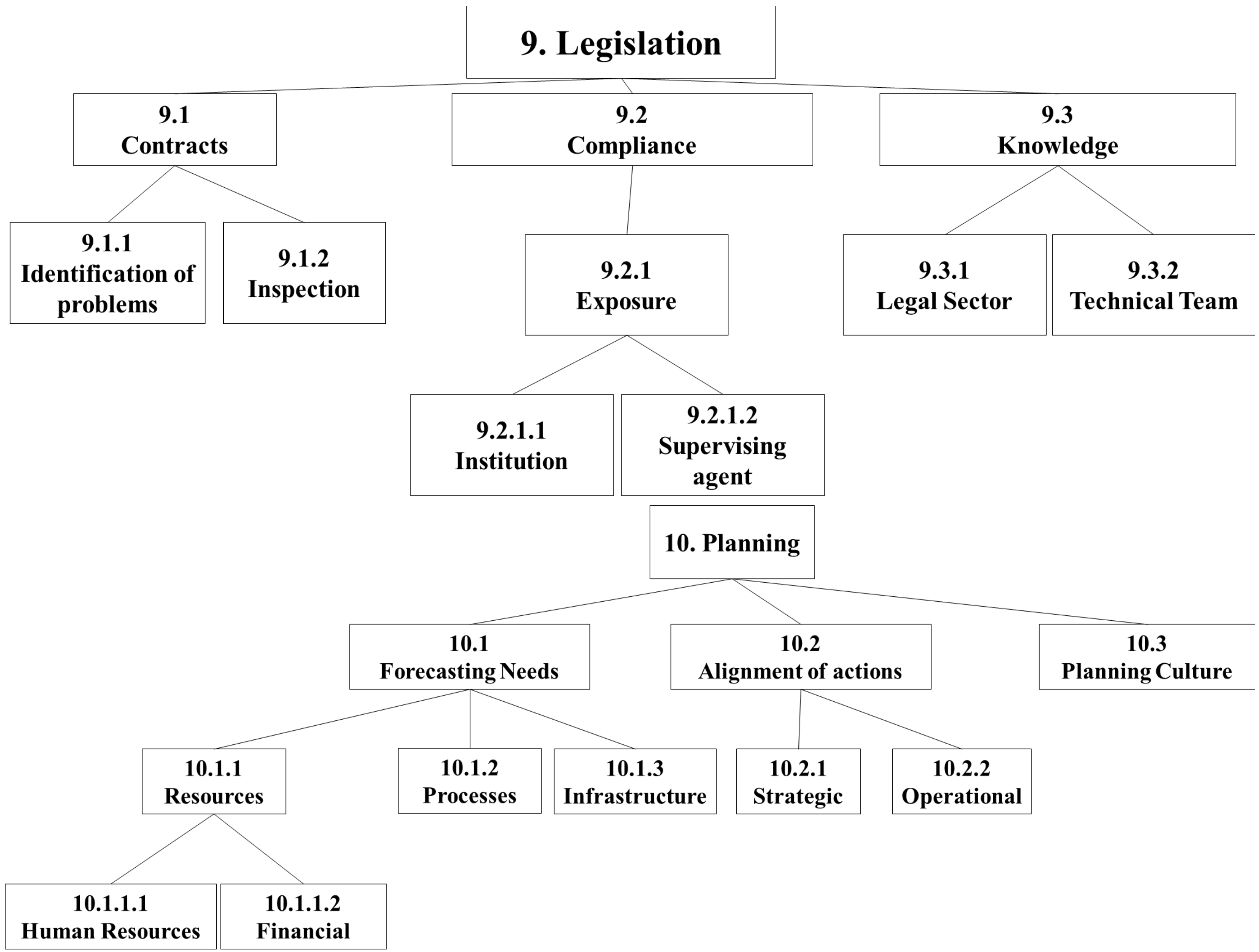

3. Infrastructure
3.1 Restoration
3.2 Modernization
3.3 Physical Space
3.1.1 Faults Identification Policy
3.1.2 Faults Identification
3.1.3 Correction
3.2.1 Fostering new ideas
3.2.2 Technological Developments
3.2.3 Equipment Automation
3.2.4 Space Modernization
3.3.1 Organization
3.3.2 Size (suitability)
3.3.3 Installed Capacity
3.3.1.1 Related areas
3.3.1.2 Mapping
3.3.1.3 Trained staff
3.3.2.1 Increase in space
3.3.2.2 Risk of infection
3.3.2.3 Time /distance of access
3.3.2.4 Space Optimization
4. Information Technology
4.1 Accessibility
4.2 Management
4.3 Systems
4.1.1 Agility
4.1.2 Ease of Use
4.2.1 Information Culture
4.2.2 Control
4.2.3 Data
4.3.1 Integration
4.3.2 Database
4.3.3 Robustness
4.3.4 Support
4.1.1.1 Agile
4.1.1.2 Response Time
4.1.2.1 Registration
4.1.2.2 Data input
4.1.2.3 Resistance
4.1.2.4 Availability
4.2.1.1 Investment
4.2.1.2 Qualification
4.2.2.1 Costs
4.2.2.2 Supplies
4.2.2.3 Rework
4.2.3.1 Reliability
4.2.3.2 Security
4.2.1.2.1 Users
4.2.1.2.2 Information flow

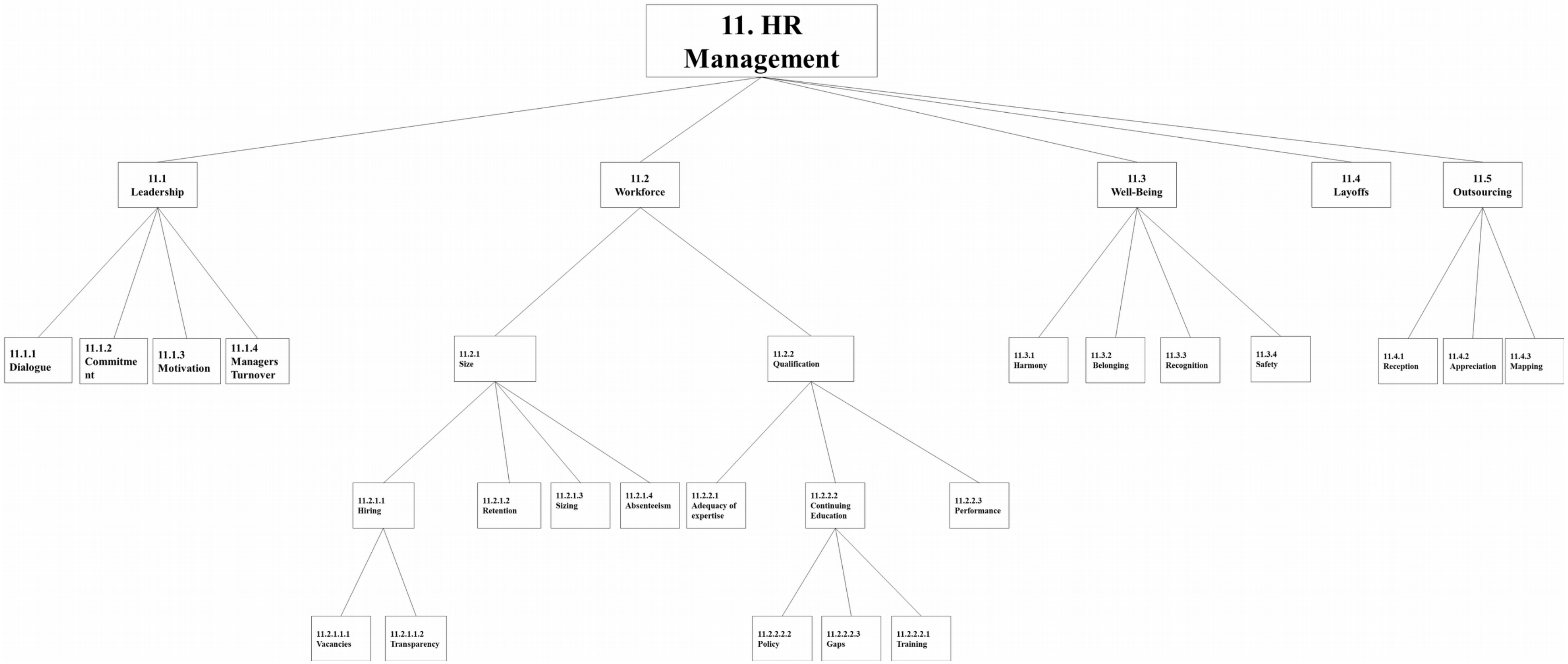

5. Teaching
5.1 Funds
5.2 Training
5.3 Access to information
5.2.1 Residence
5.2.2 Professors
5.2.3 Quality
5.2.4 Instruction
5.3.1 Supplies
5.3.2 Management Training
5.3.3 SUS


6. Purchases
6.1 Qualification
6.2 Standardization
6.3 Acquisition process
6.4 Relationship with suppliers
6.1.1 Flow of information
6.1.2 Team
6.2.1 Participation
6.2.2 Control
6.2.3 Learning
6.2.4 Crosschecking
6.3.1 Buying
6.3.2 Withdrawal
6.3.3 Review
6.3.4 Mapping of Needs
6.3.8 Best Practices
6.3.5 Time
6.3.6 Grouping
6.3.7 Acquisition policy
6.4.1 Credibility
6.4.2 Clarity
6.4.3 Deadlines
6.4.4 Flexibility
6.1.2.1 Bidding agents
6.1.2.2 Support Team
6.1.2.3 Standardization Commission
6.3.1.1 Direct Purchase
6.3.1.2 Electronic trading
6.3.5.1 Sample evaluation
6.3.5.2 Judgment of proposals
6.3.6.1 Attractiveness
6.3.6.2 Ideal quantity
6.3.7.1 Equipment
6.3.7.2 Network
6.3.7.2.1 Regional
6.3.7.2.2 National

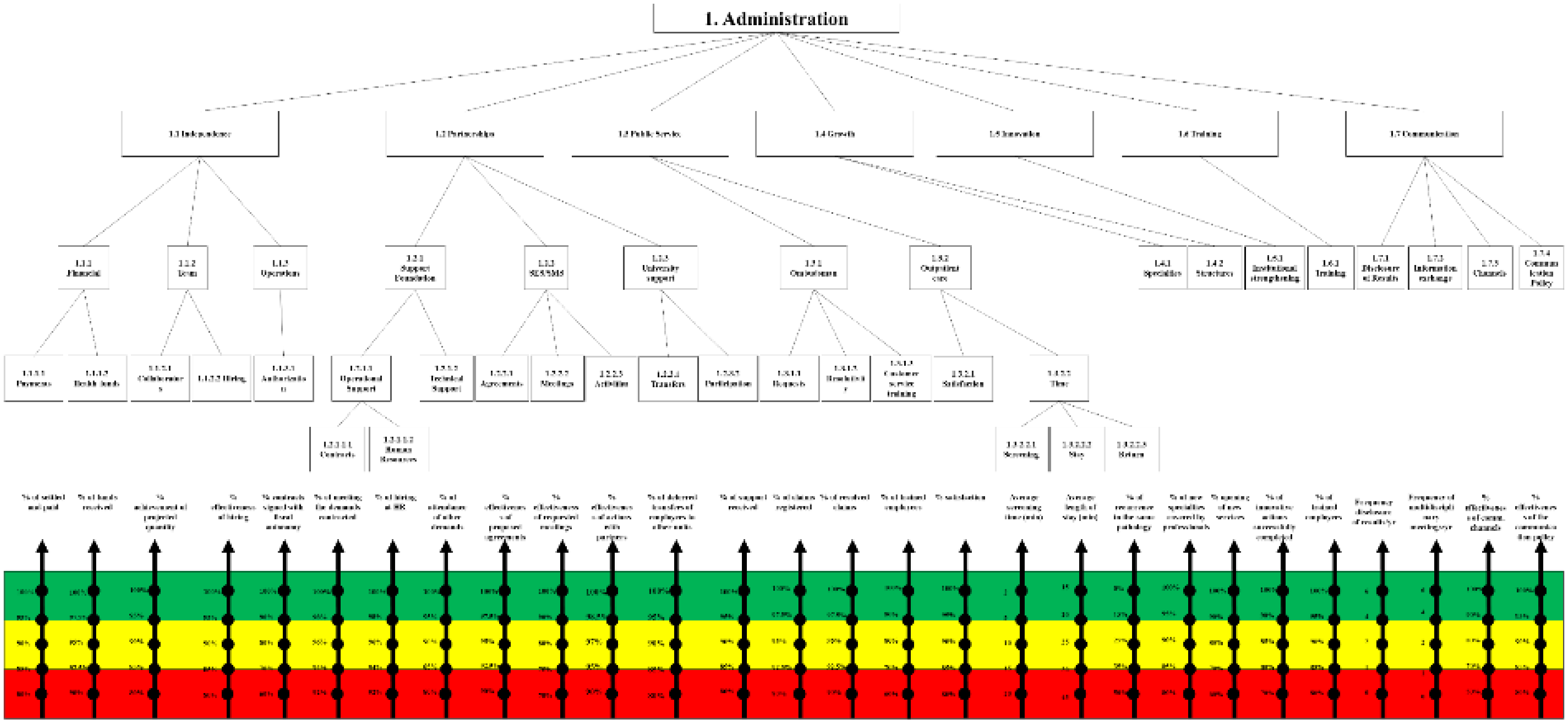

7. Logistics
7.1
Quality of Supplies
7.2
Storage
7.3
Supplier Control
7.4
Stocks
7.5
Logistic process
7.1.1
Warranty / Validity
7.1.2
Disqualification
7.1.3
Testing
7.2.1
Deliveries Schedule
7.2.2
Consumer oscillation
7.3.1
Geographical position
7.3.2
Strictness
7.3.3
Attention to errors
7.3.4
unblemished conduct
7.4.1
Control system
7.4.2
Security window
7.5.1
Supply team
7.5.2
Planning
7.1.1.1
Equipment
7.1.1.2
Supplies

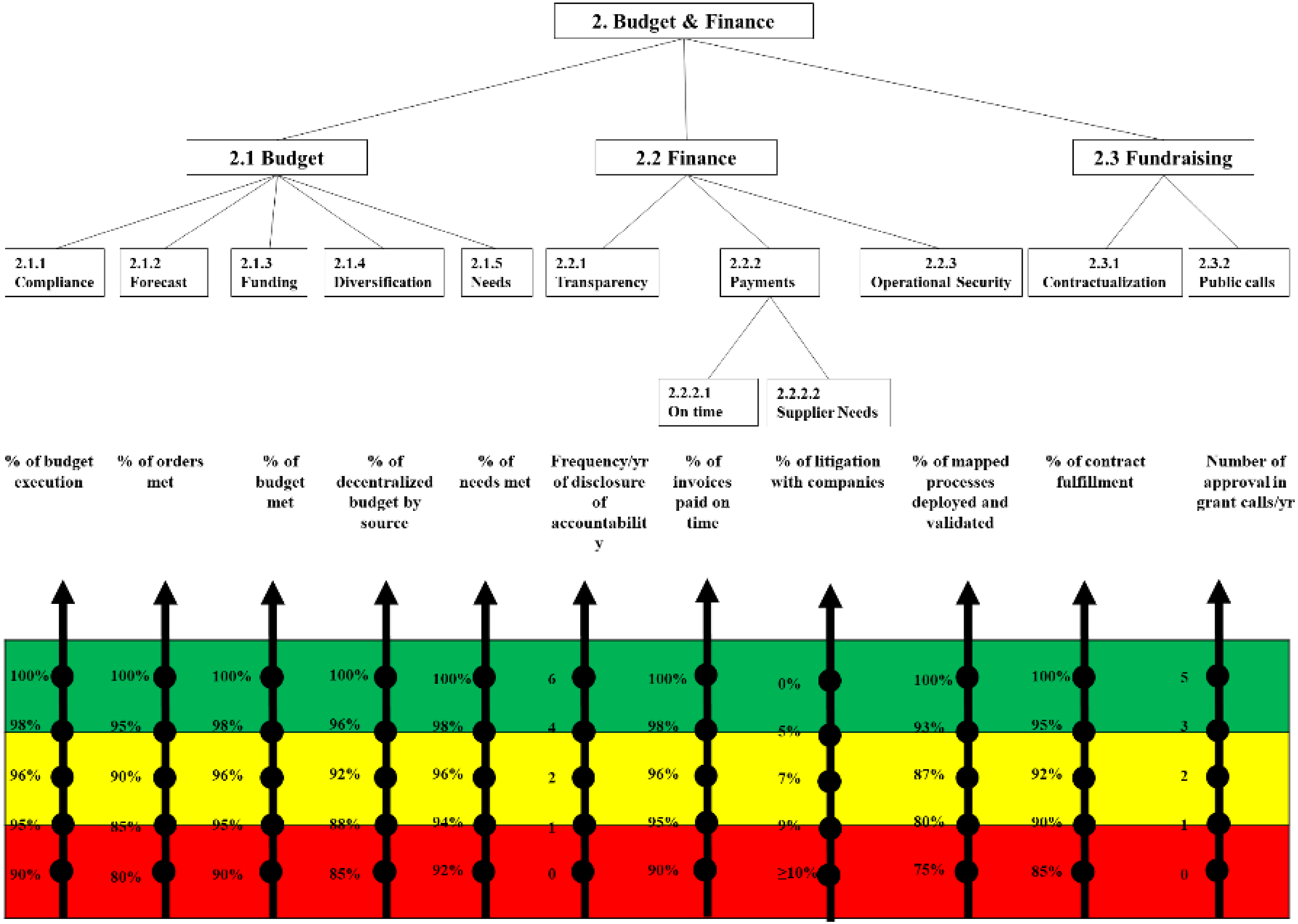

8. Politics
8.1
Activities
8.2
Succession
8.3
Stability
8.1.1
Best Practices
8.1.2
Networks
8.2.1
Team maintenance
8.2.1
Continuity of actions
8.3.1
Strengthening
8.3.2
External pressure

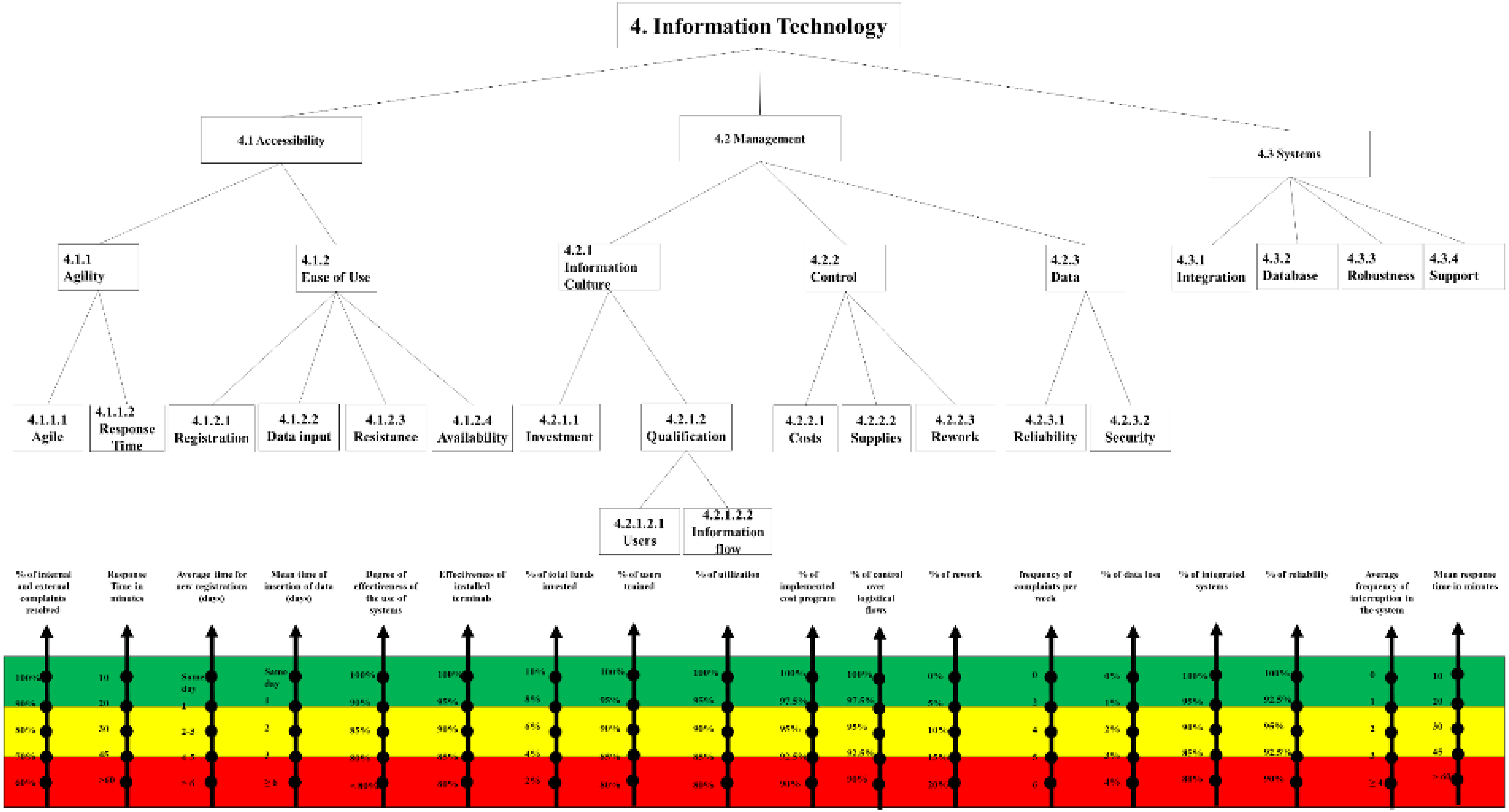

9. Legislation
9.1 Contracts
9.2 Compliance
9.3 Knowledge
9.1.1 Identification of problems
9.1.2 Inspection
9.2.1 Exposure
9.3.1 Legal Sector
9.3.2 Technical Team
9.2.1.1 Institution
9.2.1.2 Supervising agent
10. Planning
10.1 Forecasting Needs
10.2 Alignment of actions
10.3 Planning Culture
10.1.1 Resources
10.1.2 Processes
10.1.3 Infrastructure
10.2.1 Strategic
10.2.2 Operational
10.1.1.1 Human Resources
10.1.1.2 Financial

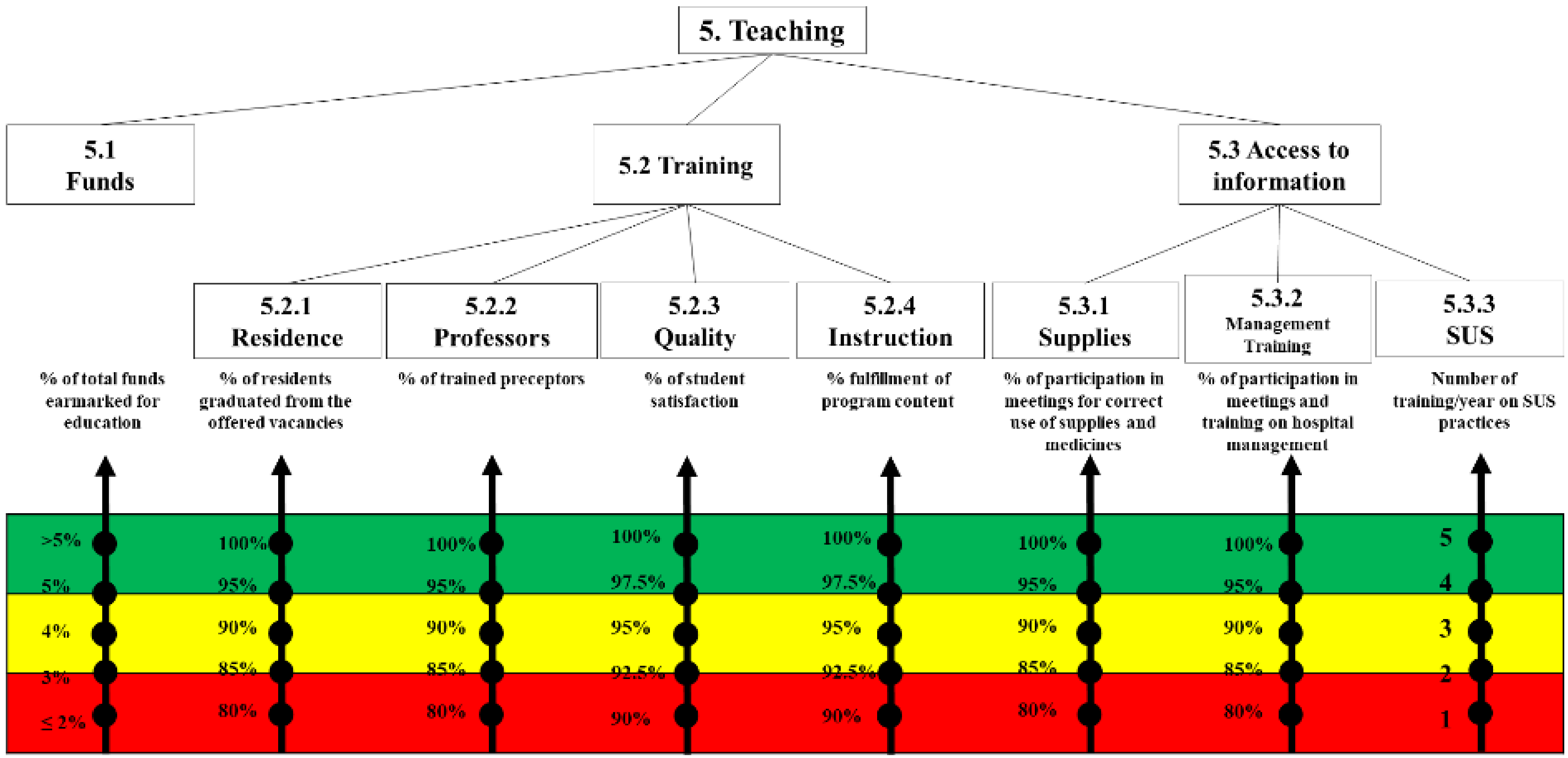

11. HR Management
11.1 Leadership
11.2 Workforce
11.3 Well-Being
11.4 Layoffs
11.5 Outsourcing
11.1.1 Dialogue
11.1.2 Commitme nt
11.1.3 Motivation
11.1.4 Managers Turnover
11.2.1 Size
11.2.2 Qualification
11.3.1 Harmony
11.3.2 Belonging
11.3.3 Recognition
11.3.4 Safety
11.4.1 Reception
11.4.2 Appreciation
11.4.3 Mapping
11.2.1.1 Hiring
11.2.1.2 Retention
11.2.1.3 Sizing
11.2.1.4 Absenteeism
11.2.2.1 Adequacy of expertise
11.2.2.2 Continuing Education
11.2.2.3 Performance
11.2.1.1.1 Vacancies
11.2.1.1.2 Transparency
11.2.2.2.2 Policy
11.2.2.2.3 Gaps
11.2.2.2.1 Training

APPENDIX E: HIERARCHICAL STRUCTURE OF VALUE, DESCRIPTORS AND LEVELS OF REFERENCE BY AREA OF CONCERN




2. Budget & Finance
2.1 Budget
2.2 Finance
2.3 Fundraising
2.1.1 Compliance
2.1.2 Forecast
2.1.3 Funding
2.1.4 Diversification
2.1.5 Needs
2.2.1 Transparency
2.2.2 Payments
2.2.3 Operational Security
2.3.1 Contractualization
2.3.2 Public calls
2.2.2.1 On time
2.2.2.2 Supplier Needs
% of budget execution
% of orders met
% of budget met
% of decentralized budget by source
% of needs met
Frequency/yr of disclosure of accountability
% of invoices paid on time
% of litigation with companies
% of mapped processes deployed and validated
% of contract fulfillment
Number of approval in grant calls/yr
100% 98% 96% 95% 90%
100% 95% 90% 85% 80%
100% 98% 96% 95% 90%
100% 96% 92% 88% 85%
100% 98% 96% 94% 92%
6 4 2 1 0
100% 98% 96% 95% 90%
0% 5% 7% 9% ≥10%
100% 93% 87% 80% 75%
100% 95% 92% 90% 85%
5 3 2 1 0


4. Information Technology
4.1 Accessibility
4.2 Management
4.3 Systems
4.1.1 Agility
4.1.2 Ease of Use
4.2.1 Information Culture
4.2.2 Control
4.2.3 Data
4.3.1 Integration
4.3.2 Database
4.3.3 Robustness
4.3.4 Support
4.1.1.1 Agile
4.1.1.2 Response Time
4.1.2.1 Registration
4.1.2.2 Data input
4.1.2.3 Resistance
4.1.2.4 Availability
4.2.1.1 Investment
4.2.1.2 Qualification
4.2.2.1 Costs
4.2.2.2 Supplies
4.2.2.3 Rework
4.2.3.1 Reliability
4.2.3.2 Security
4.2.1.2.1 Users
4.2.1.2.2 Information flow
% of internal and external complaints resolved
Response Time in minutes
Average time for new registrations (days)
Mean time of insertion of data (days)
Degree of effectiveness of the use of systems
Effectiveness of installed terminals
% of total funds invested
% of users trained
% of utilization
% of implemented cost program
% of control over logistical flows
% of rework
Frequency of complaints per week
% of data loss
% of integrated systems
% of reliability
Average frequency of interruption in the system
Mean response time in minutes


5. Teaching
5.1 Funds
5.2 Training
5.3 Access to information
5.2.1 Residence
5.2.2 Professors
5.2.3 Quality
5.2.4 Instruction
5.3.1 Supplies
5.3.2 Management Training
5.3.3 SUS
% of total funds earmarked for education
% of residents graduated from the offered vacancies
% of trained preceptors
% of student satisfaction
% fulfillment of program content
% of participation in meetings for correct use of supplies and medicines
% of participation in meetings and training on hospital management
Number of training/year on SUS practices
>5%
5%
4%
3%
≤ 2%
100%
95%
90%
85%
80%
100%
95%
90%
85%
80%
100%
97.5%
95%
92.5%
90%
100%
97.5%
95%
92.5%
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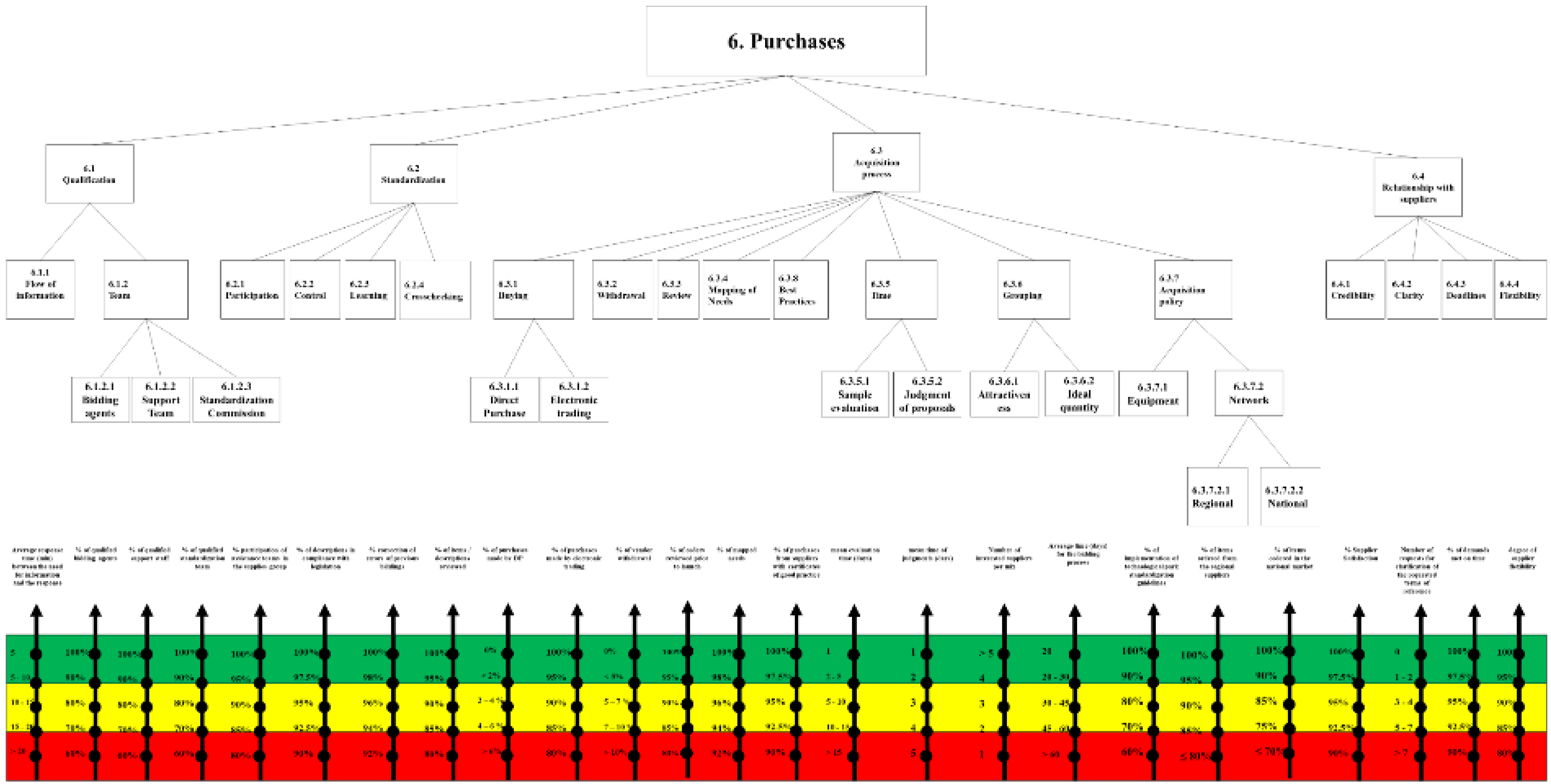
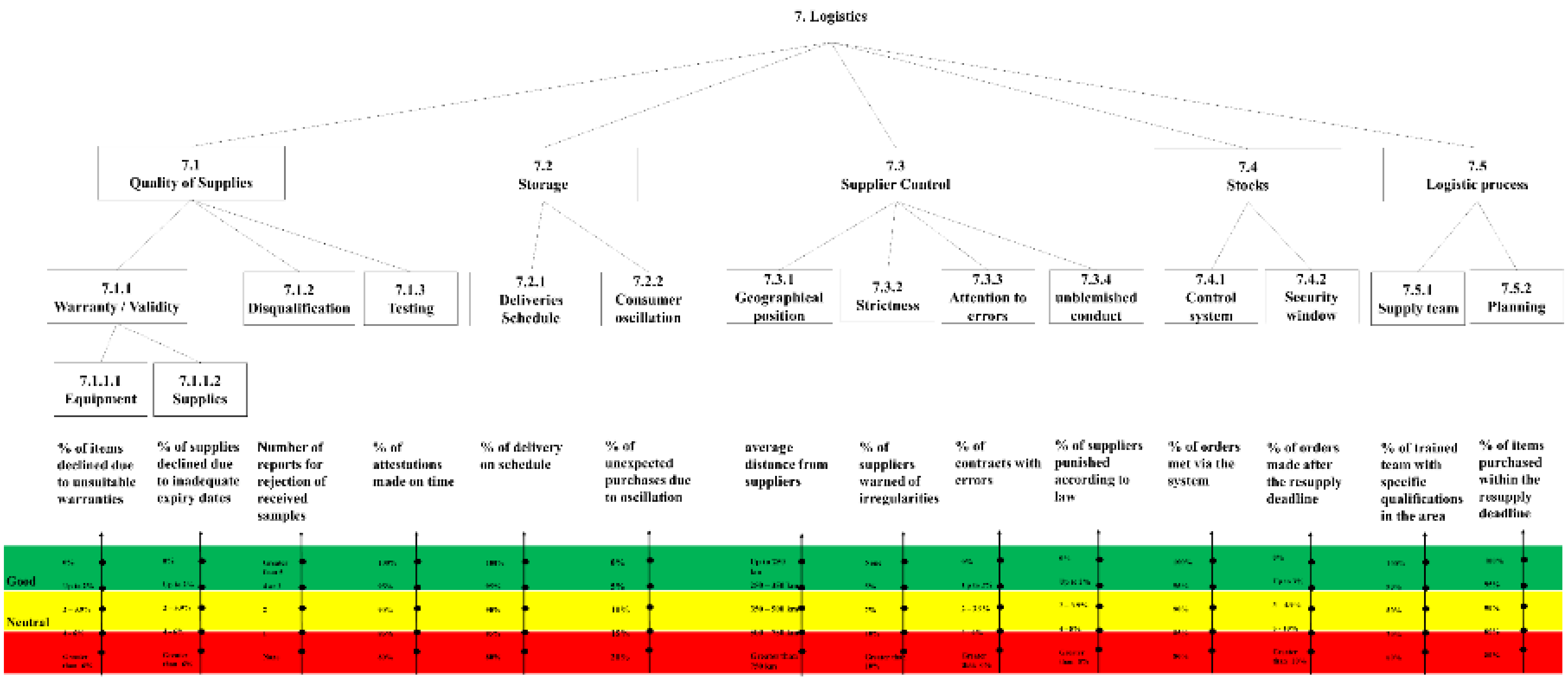
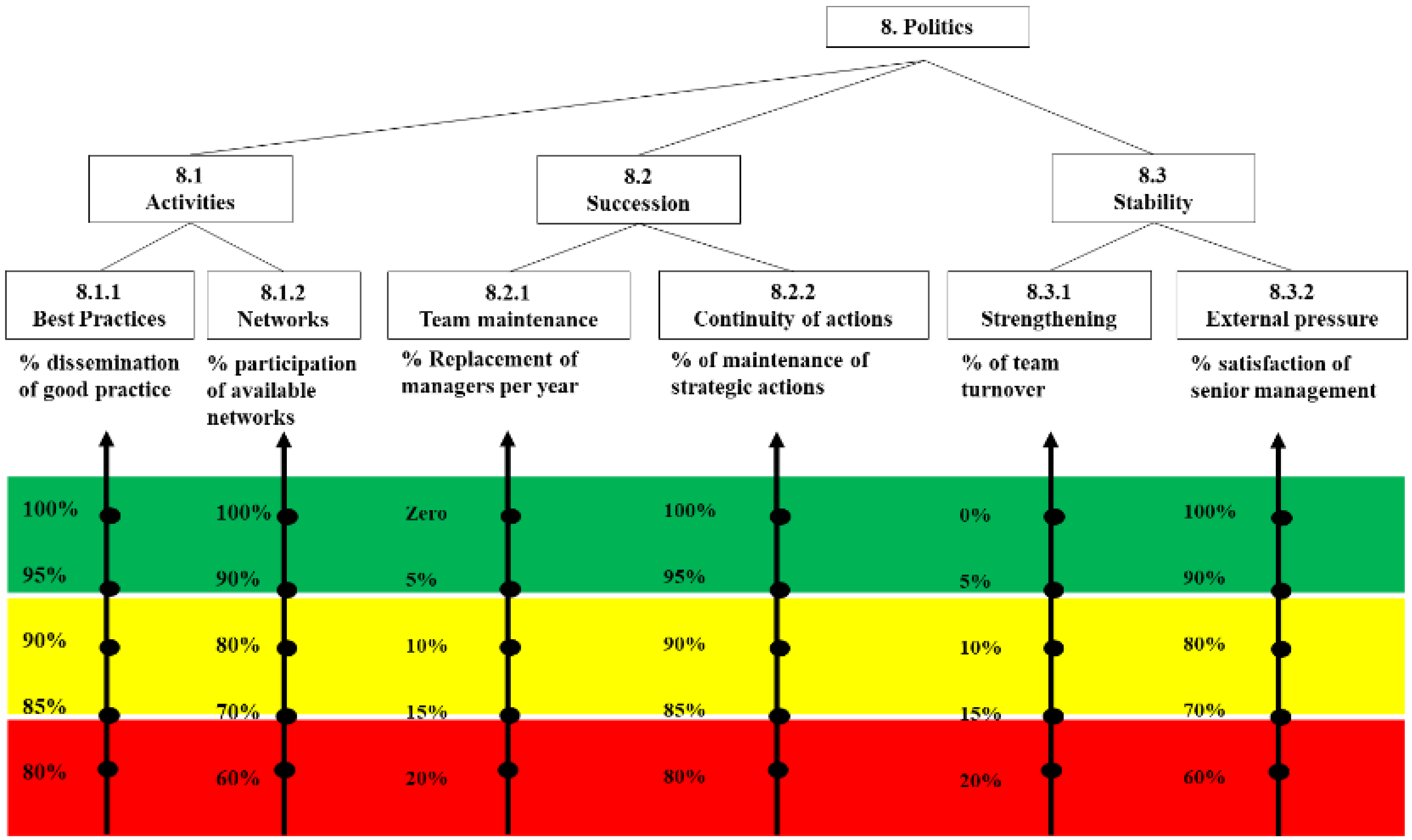
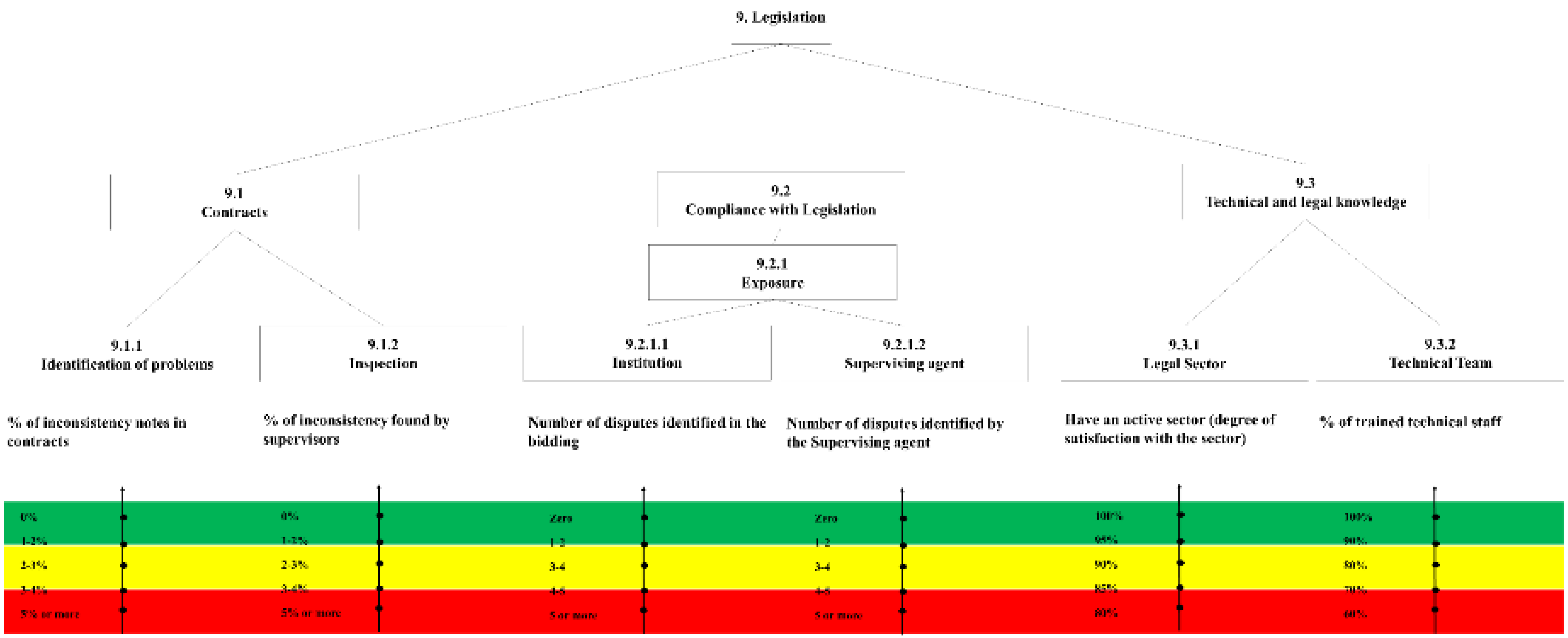
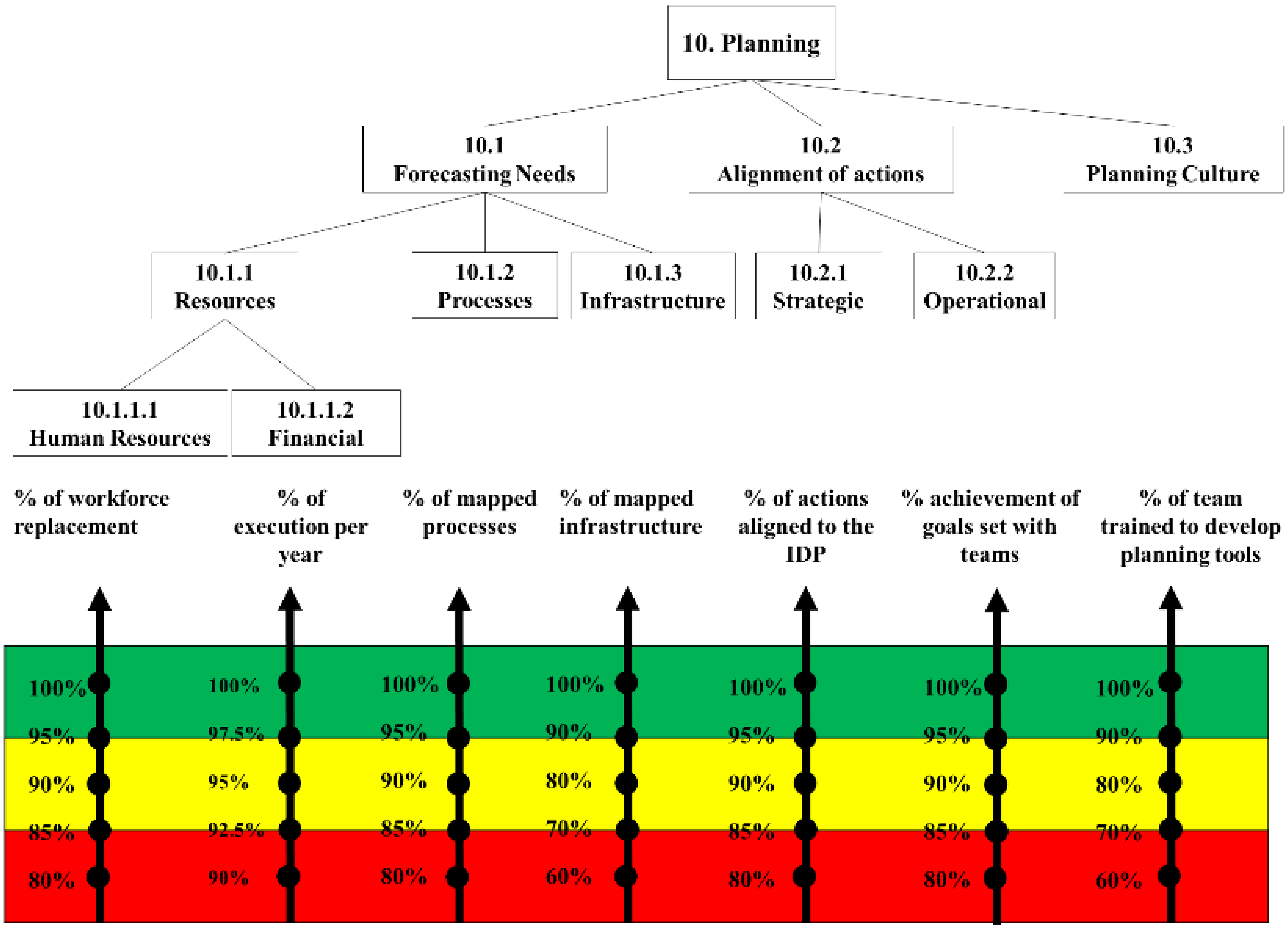
5
4
3
2
1

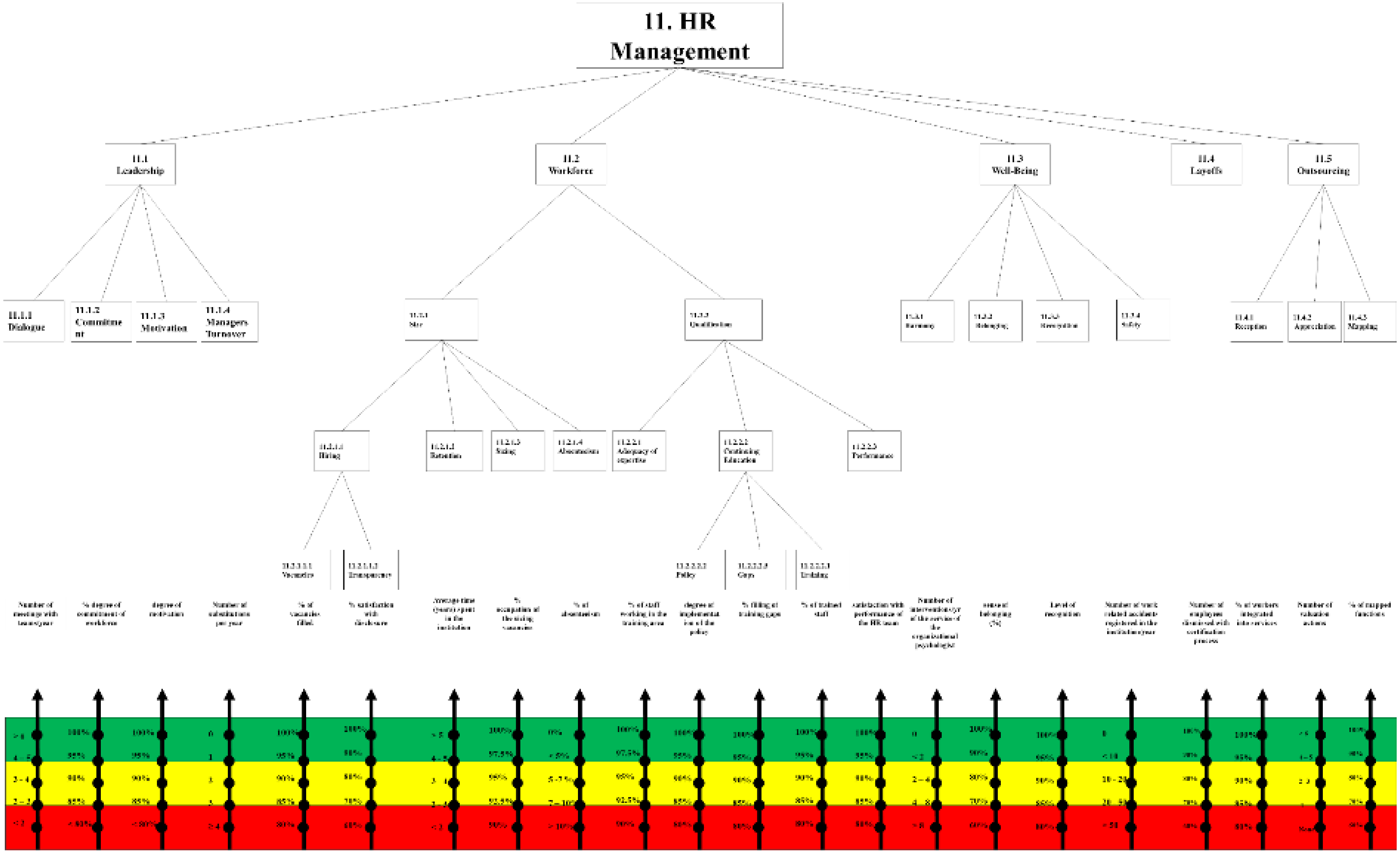

6. Purchases
6.1 Qualification
6.2 Standardization
6.3 Acquisition process
6.4 Relationship with suppliers
6.1.1 Flow of information
6.1.2 Team
6.2.1 Participation
6.2.2 Control
6.2.3 Learning
6.2.4 Crosschecking
6.3.1 Buying
6.3.2 Withdrawal
6.3.3 Review
6.3.4 Mapping of Needs
6.3.8 Best Practices
6.3.5 Time
6.3.6 Grouping
6.3.7 Acquisition policy
6.4.1 Credibility
6.4.2 Clarity
6.4.3 Deadlines
6.4.4 Flexibility
6.1.2.1 Bidding agents
6.1.2.2 Support Team
6.1.2.3 Standardization Commission
6.3.1.1 Direct Purchase
6.3.1.2 Electronic trading
6.3.5.1 Sample evaluation
6.3.5.2 Judgment of proposals
6.3.6.1 Attractiveness
6.3.6.2 Ideal quantity
6.3.7.1 Equipment
6.3.7.2 Network
6.3.7.2.1 Regional
6.3.7.2.2 National


7. Logistics
7.1
Quality of Supplies
7.2
Storage
7.3
Supplier Control
7.4
Stocks
7.5
Logistic process
7.1.1
Warranty / Validity
7.1.2
Disqualification
7.1.3
Testing
7.2.1
Deliveries
Schedule
7.2.2
Consumer
oscillation
7.3.1
Geographical
position
7.3.2
Strictness
7.3.3
Attention to
errors
7.3.4
unblemished
conduct
7.4.1
Control
system
7.4.2
Security
window
7.5.1
Supply team
7.5.2
Planning
7.1.1.1
Equipment
7.1.1.2
Supplies
% of items declined due to unsuitable warranties
% of supplies declined due to inadequate expiry dates
Number of reports for rejection of received samples
% of attestations made on time
% of delivery on schedule
% of unexpected purchases due to oscillation
average distance from suppliers
% of suppliers warned of irregularities
% of contracts with errors
% of suppliers punished according to law
% of orders met via the system
% of orders made after the resupply deadline
% of trained team with specific qualifications in the area
% of items purchased within the resupply deadline
Good
Neutral

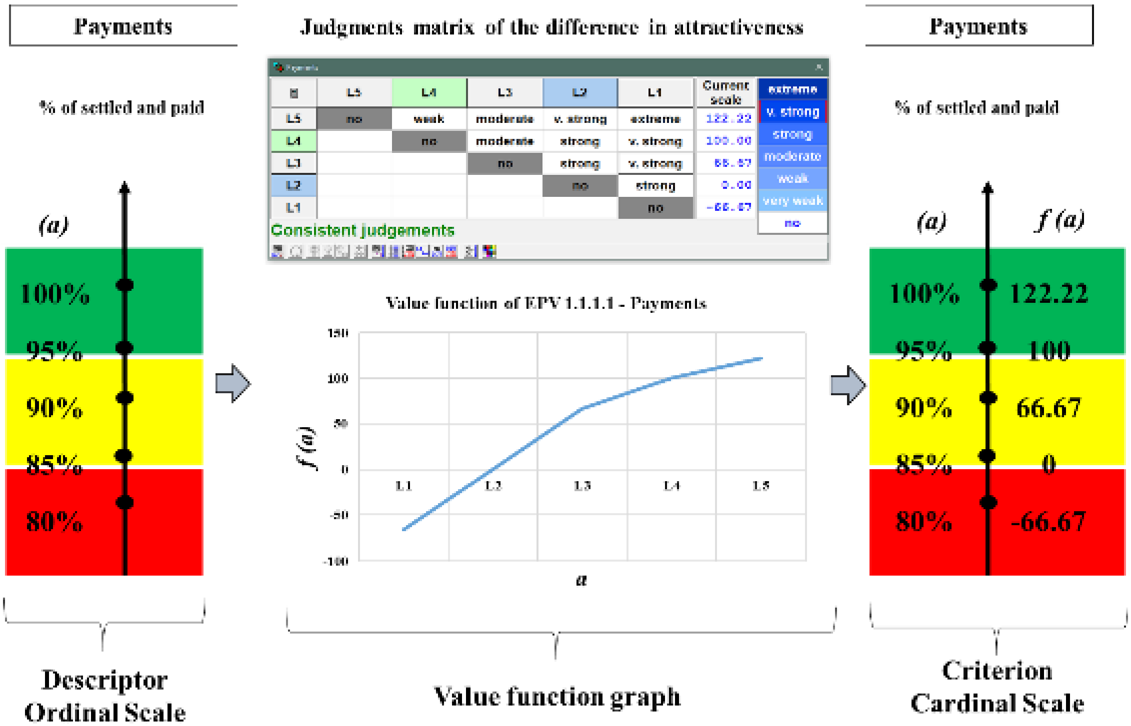

8. Politics
8.1
Activities
8.2
Succession
8.3
Stability
8.1.1
Best Practices
8.1.2
Networks
8.2.1
Team maintenance
8.2.2
Continuity of actions
8.3.1
Strengthening
8.3.2
External pressure
% dissemination of good practice
% participation of available networks
% Replacement of managers per year
% of maintenance of strategic actions
% of team turnover
% satisfaction of senior management
100%
95%
90%
85%
80%
100%
90%
80%
70%
60%
Zero
5%
10%
15%
20%
100%
95%
90%
85%
80%
0%
5%
10%
15%
20%
100%
90%
80%
70%
60%


9. Legislation
9.1
Contracts
9.2
Compliance with Legislation
9.3
Technical and legal knowledge
9.2.1
Exposure
9.1.1
Identification of problems
9.1.2
Inspection
9.2.1.1
Institution
9.2.1.2
Supervising agent
9.3.1
Legal Sector
9.3.2
Technical Team
% of inconsistency notes in contracts
% of inconsistency found by supervisors
Number of disputes identified in the bidding
Number of disputes identified by the Supervising agent
Have an active sector (degree of satisfaction with the sector)
% of trained technical staff
0%
1-2%
2-3%
3-4%
5% or more
0%
1-2%
2-3%
3-4%
5% or more
Zero
1-2
3-4
4-5
5 or more
Zero
1-2
3-4
4-5
5 or more
100%
95%
90%
85%
80%
100%
90%
80%
70%
60%

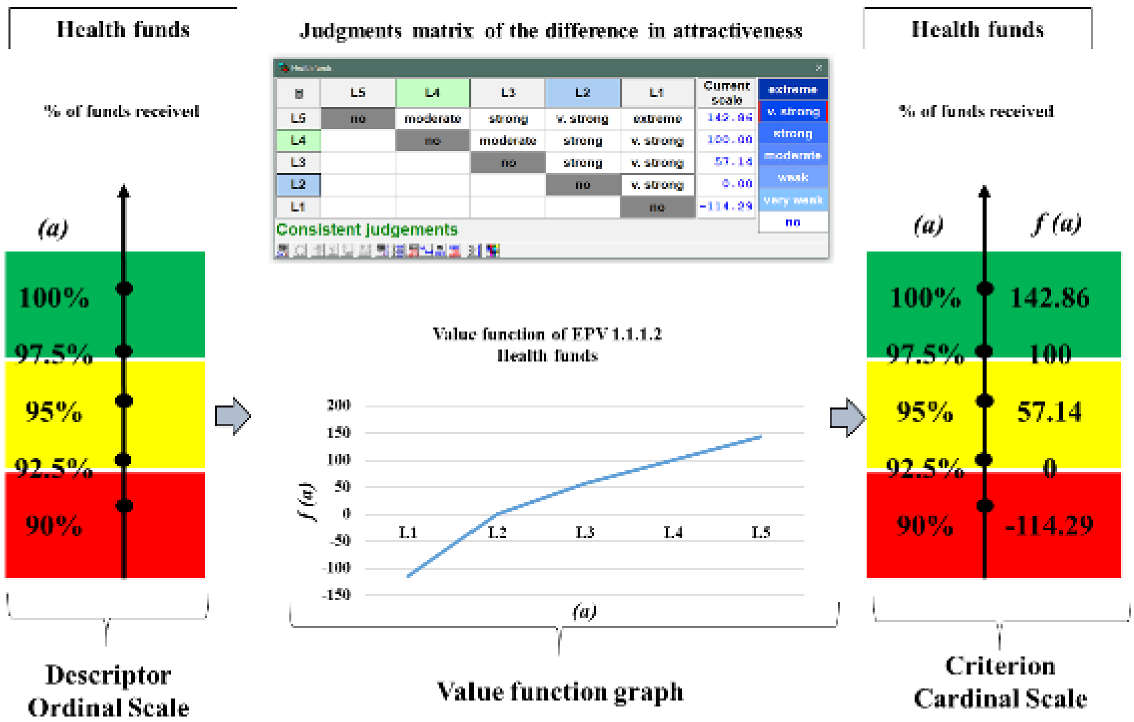

10. Planning
10.1 Forecasting Needs
10.2 Alignment of actions
10.3 Planning Culture
10.1.1 Resources
10.1.2 Processes
10.1.3 Infrastructure
10.2.1 Strategic
10.2.2 Operational
10.1.1.1 Human Resources
10.1.1.2 Financial
% of workforce replacement
% of execution per year
% of mapped processes
% of mapped infrastructure
% of actions aligned to the IDP
% achievement of goals set with teams
% of team trained to develop planning tools
100% 95% 90% 85% 80%
100% 97.5% 95% 92.5% 90%
100% 95% 90% 85% 80%
100% 90% 80% 70% 60%
100% 95% 90% 85% 80%
100% 95% 90% 85% 80%
100% 90% 80% 70% 60%


11. HR Management
11.1 Leadership
11.2 Workforce
11.3 Well-Being
11.4 Layoffs
11.5 Outsourcing
11.1.1 Dialogue
11.1.2 Commitment
11.1.3 Motivation
11.1.4 Managers Turnover

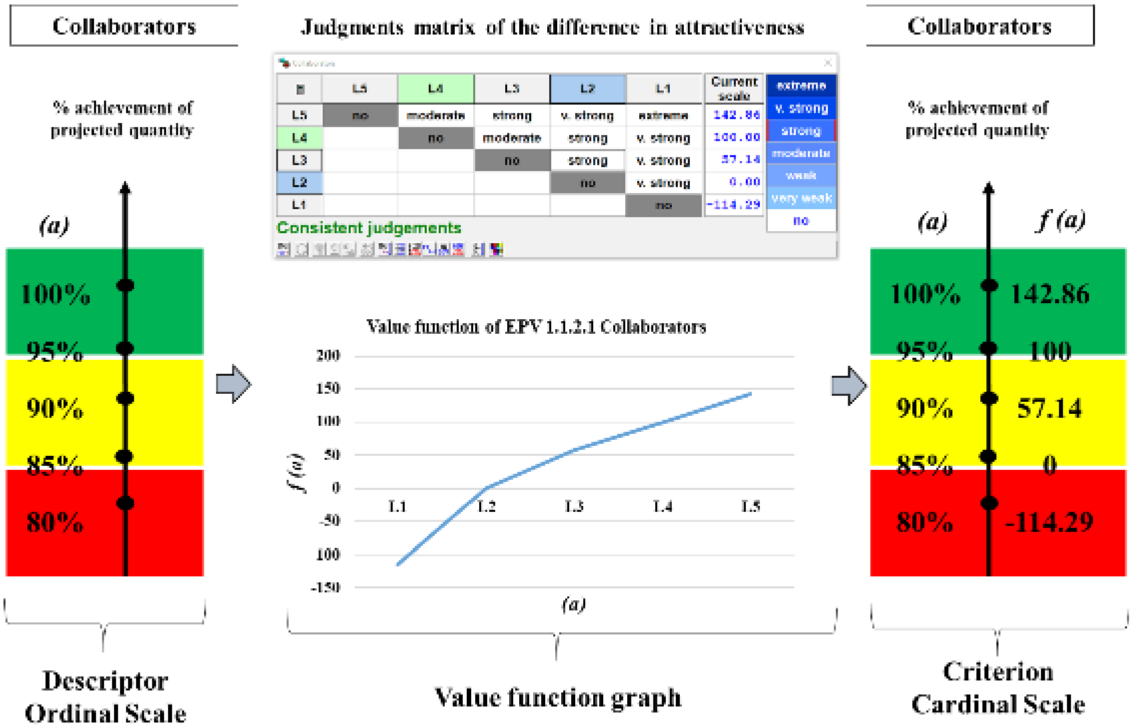
APPENDIX F: TRANSFORMATION OF ORDINAL IN CARDINAL SCALES

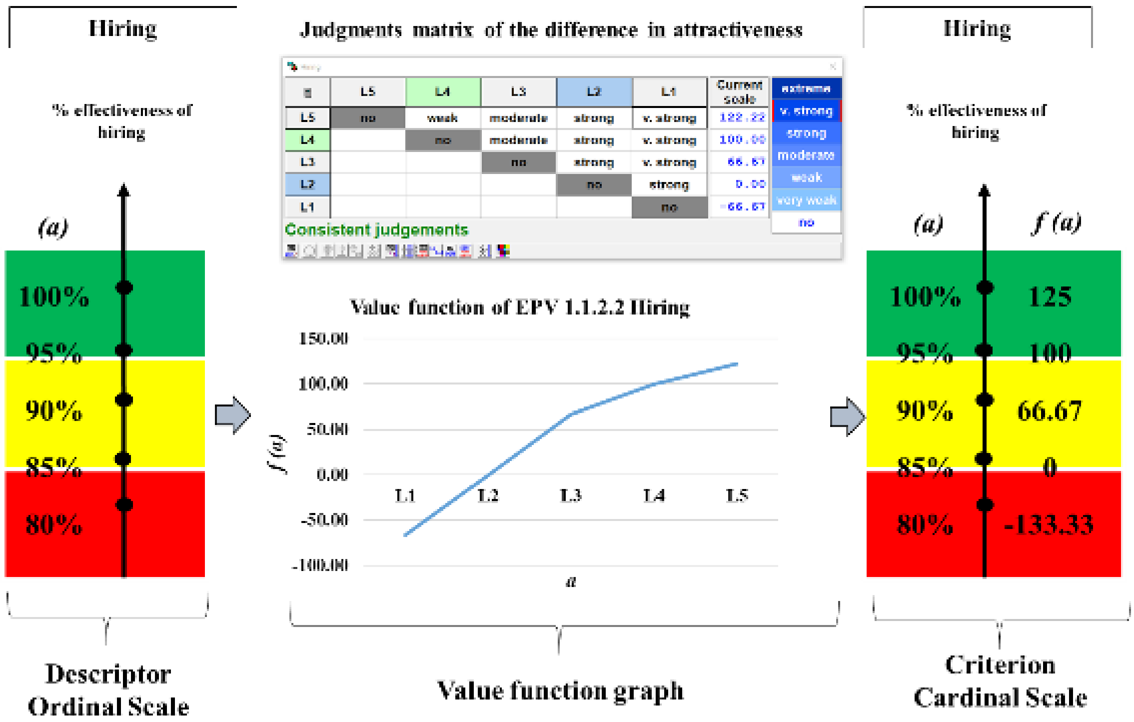


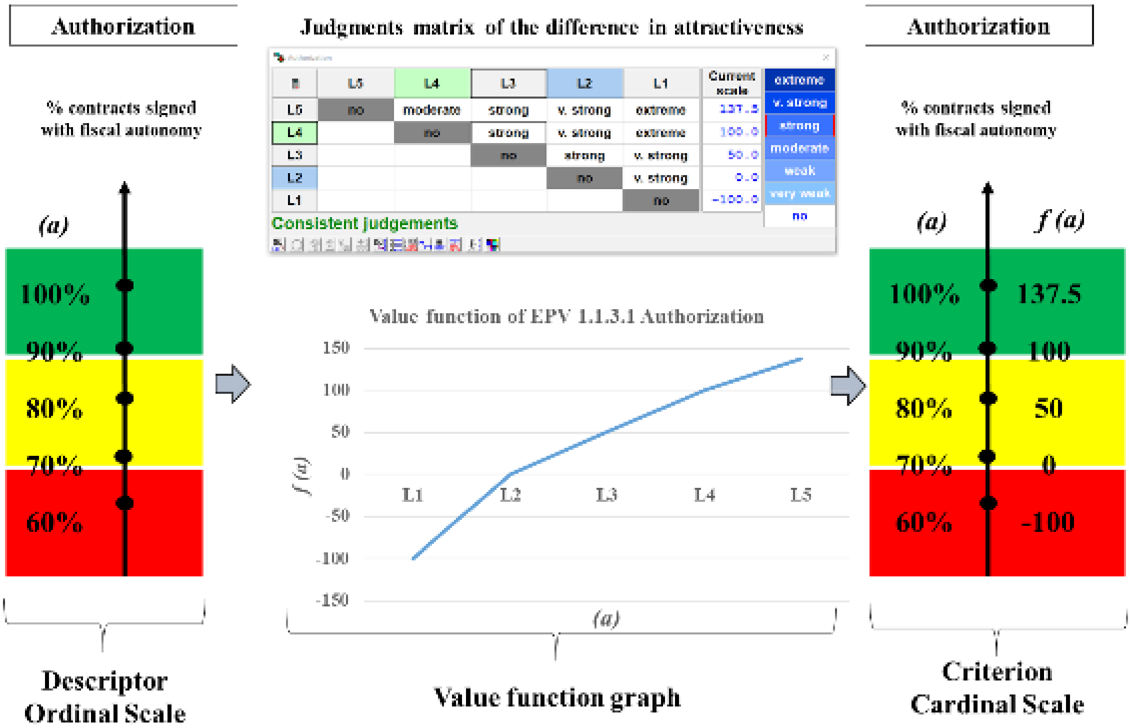
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	v. strong	extreme	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	strong	0.00
L1					no	-66.67

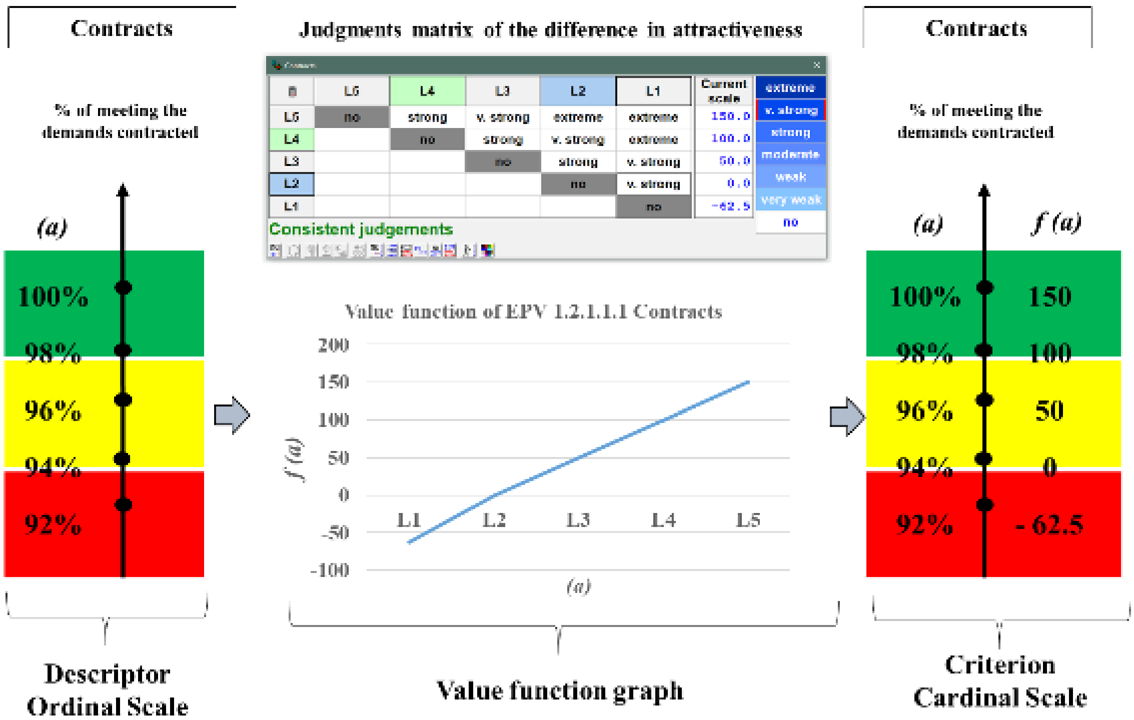


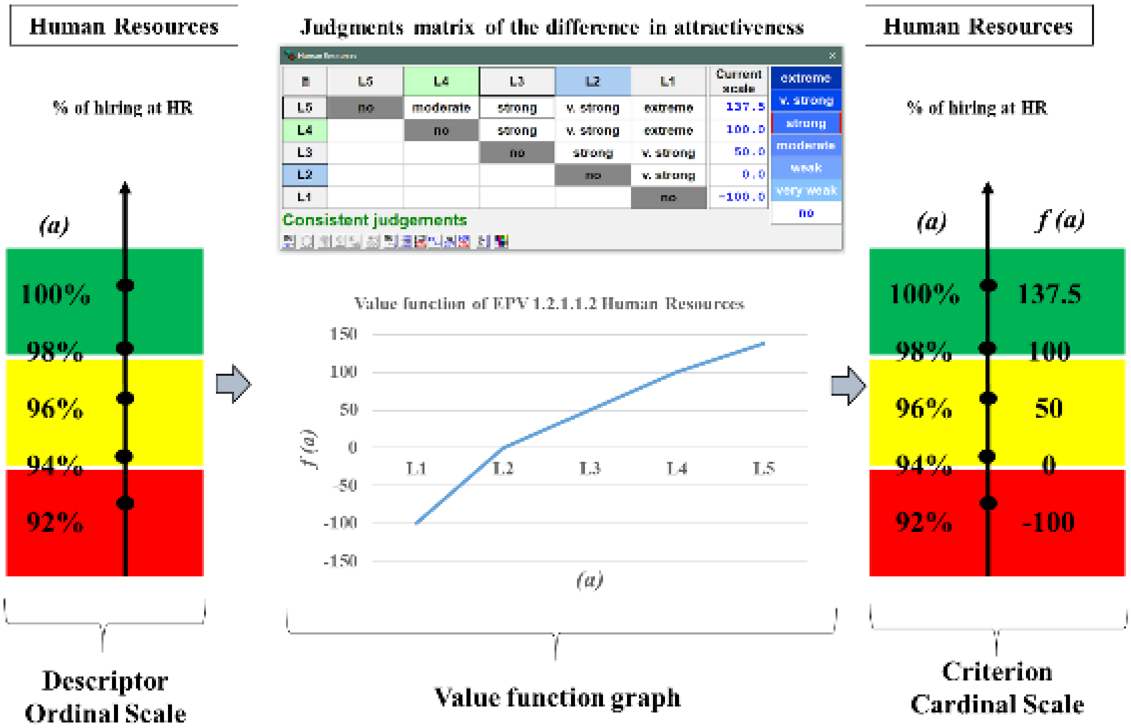
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	142.86
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	57.14
L2				no	v. strong	0.00
L1					no	-114.29

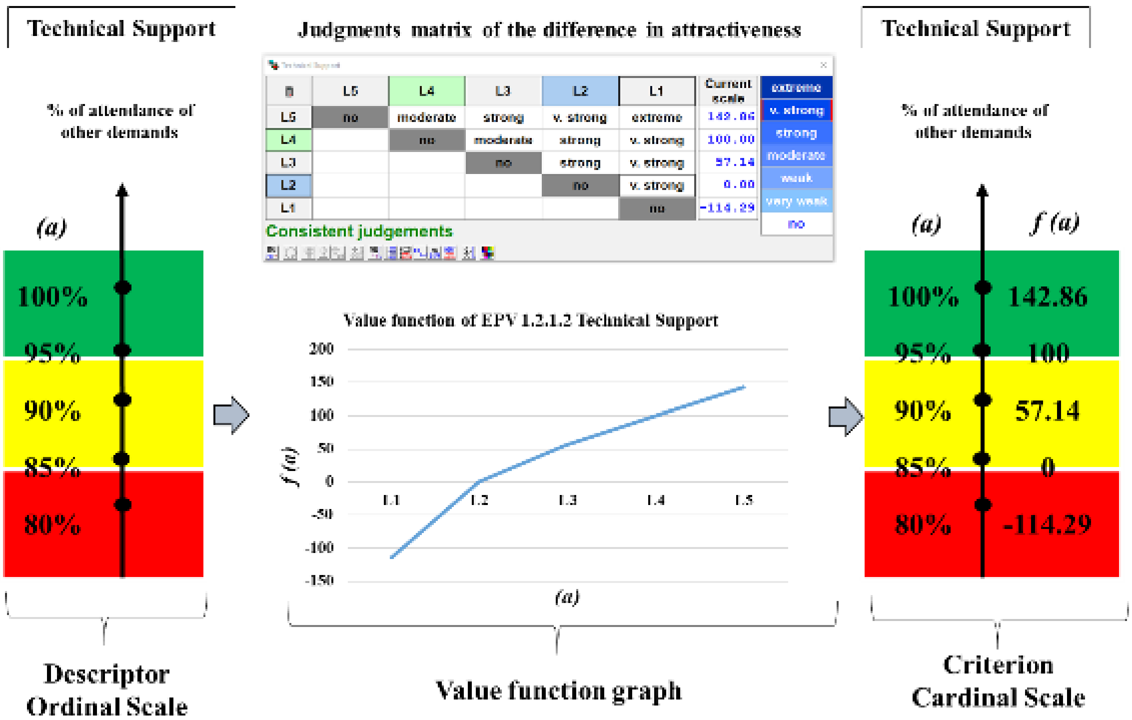

Collaborators
% achievement of projected quantity
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 142.86
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 57.14
L2 no v. strong 0.00
L1 no -114.29
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.1.2.1 Collaborators
200
150
100
50
0
-50
100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Collaborators
% achievement of projected quantity
(a) f (a)
100% 142.86
95% 100
90% 57.14
85% 0
80% -114.29
Criterion Cardinal Scale

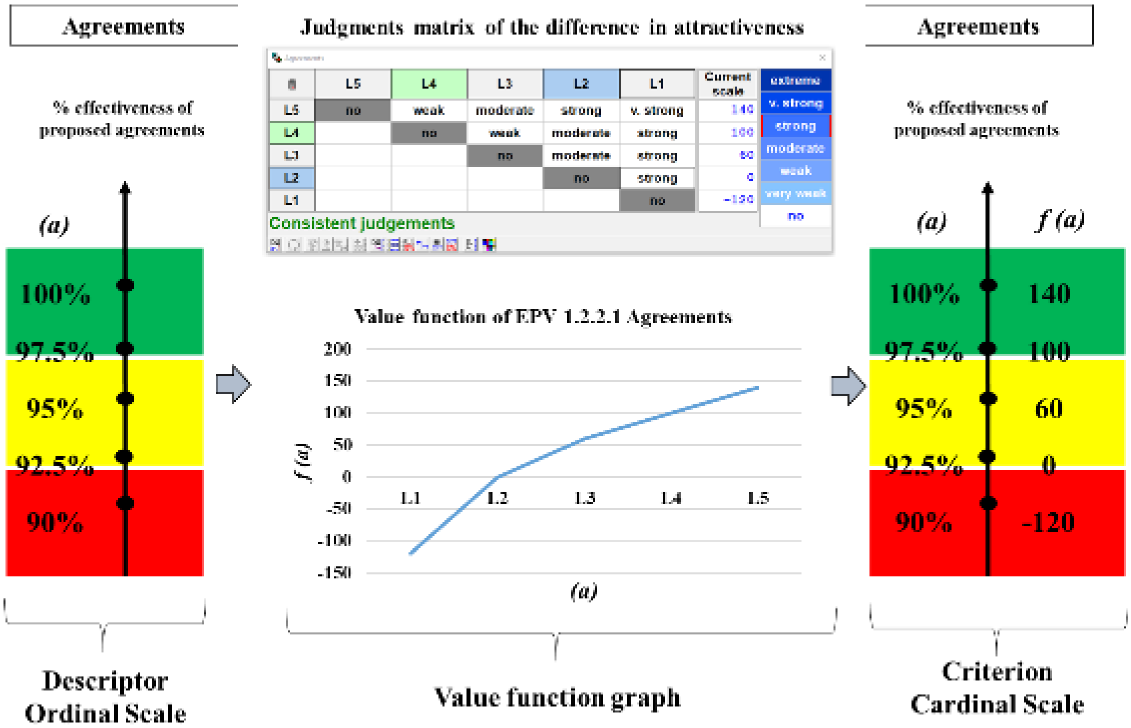

Hiring
% effectiveness of hiring
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.1.2.2 Hiring
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
L1 L2 L3 L4 L5
a
Value function graph
Hiring
% effectiveness of hiring
(a) f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale

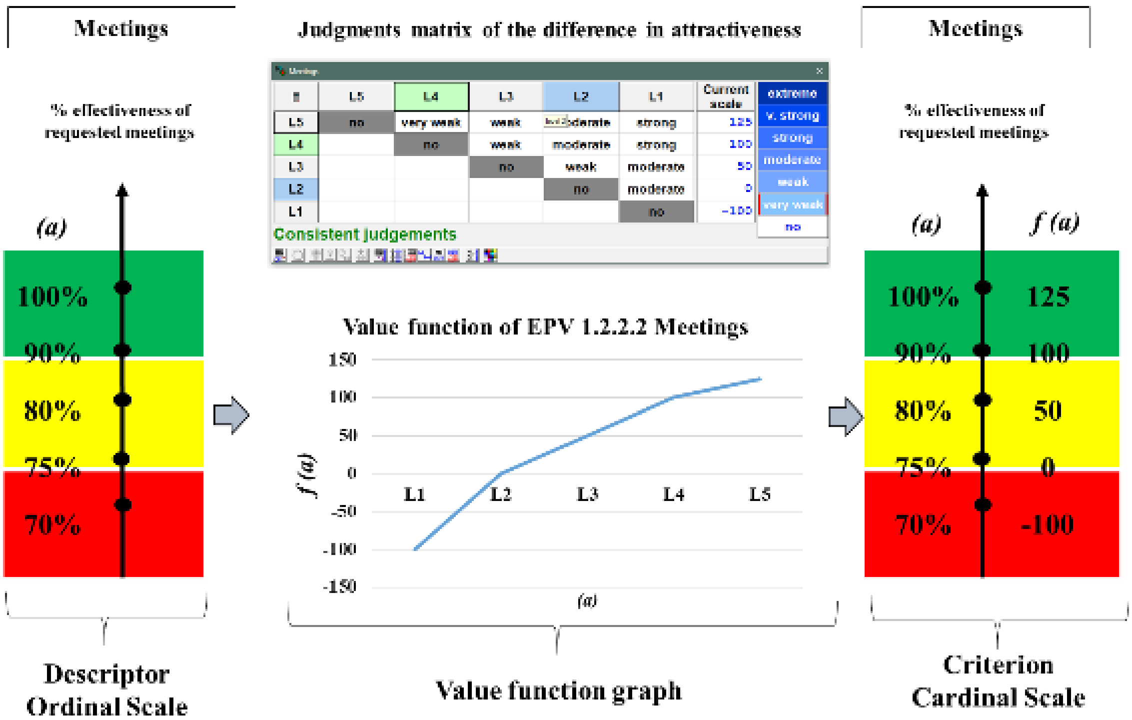

Authorization
% contracts signed with fiscal autonomy
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -100.0
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 1.1.3.1 Authorization
150 100 50 0 -50 -100 -150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Authorization
% contracts signed with fiscal autonomy
(a) f (a)
100% 137.5
90% 100
80% 50
70% 0
60% -100
Criterion Cardinal Scale

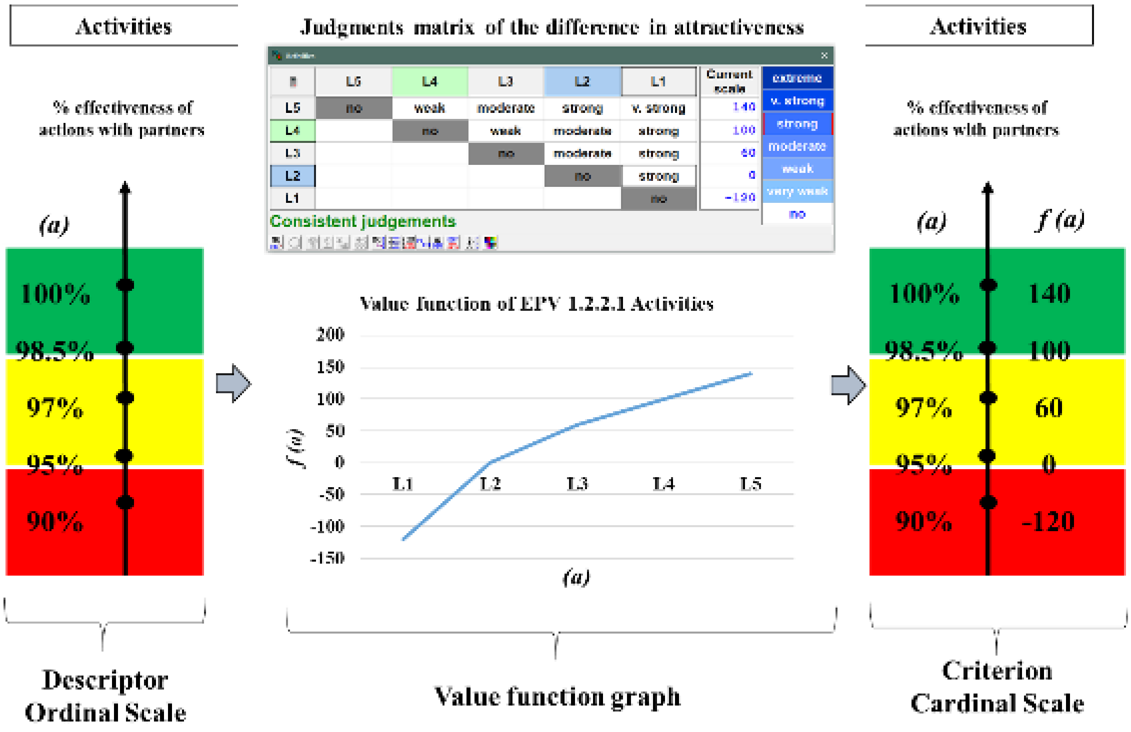

Contracts
% of meeting the demands contracted
(a)
100%
98%
96%
94%
92%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no strong v. strong extreme extreme 150.0
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -62.5
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 1.2.1.1.1 Contracts
200 150 100 50 0 -50 -100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Contracts
% of meeting the demands contracted
(a) f (a)
100% 150
98% 100
96% 50
94% 0
92% - 62.5
Criterion Cardinal Scale

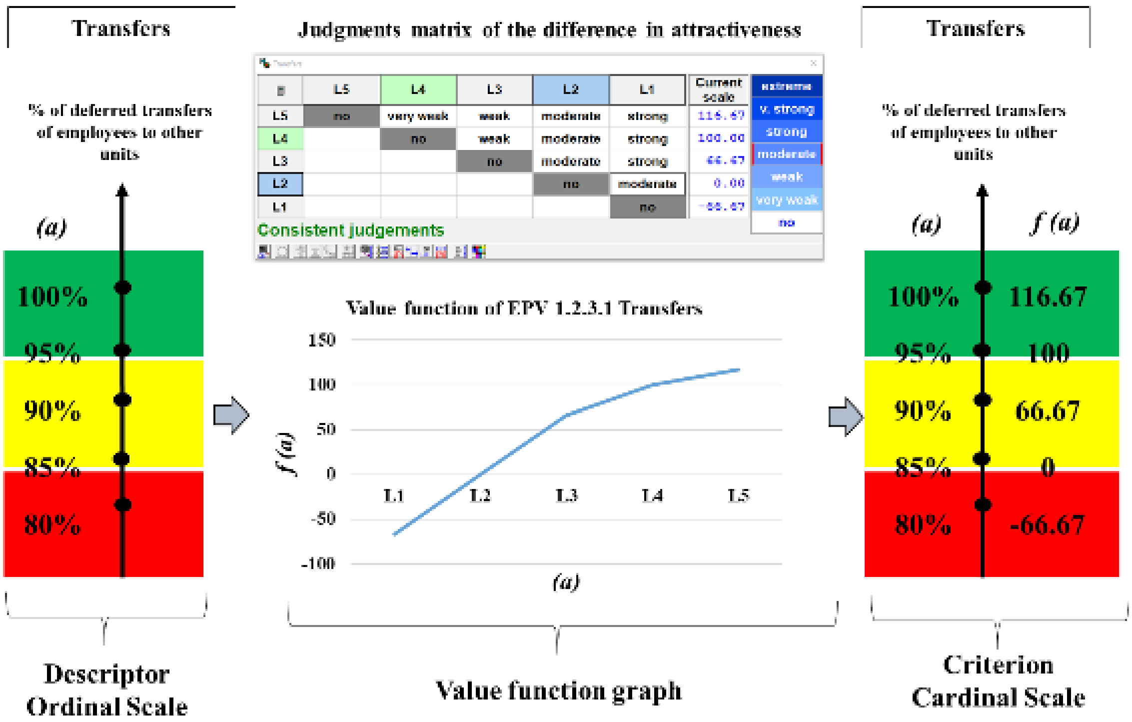

Human Resources
% of hiring at HR
(a)
100%
98%
96%
94%
92%
Descriptor
Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
moderate
strong
v. strong
extreme
137.5
100.0
50.0
0.0
-100.0
weak
very weak
Consistent judgements
Value function of EPV 1.2.1.1.2 Human Resources
f (a)
150
100
50
0
-50
-100
-150
Value function graph
Human Resources
% of hiring at HR
(a)
f (a)
100%
137.5
98%
100
96%
50
94%
0
92%
-100
Criterion
Cardinal Scale

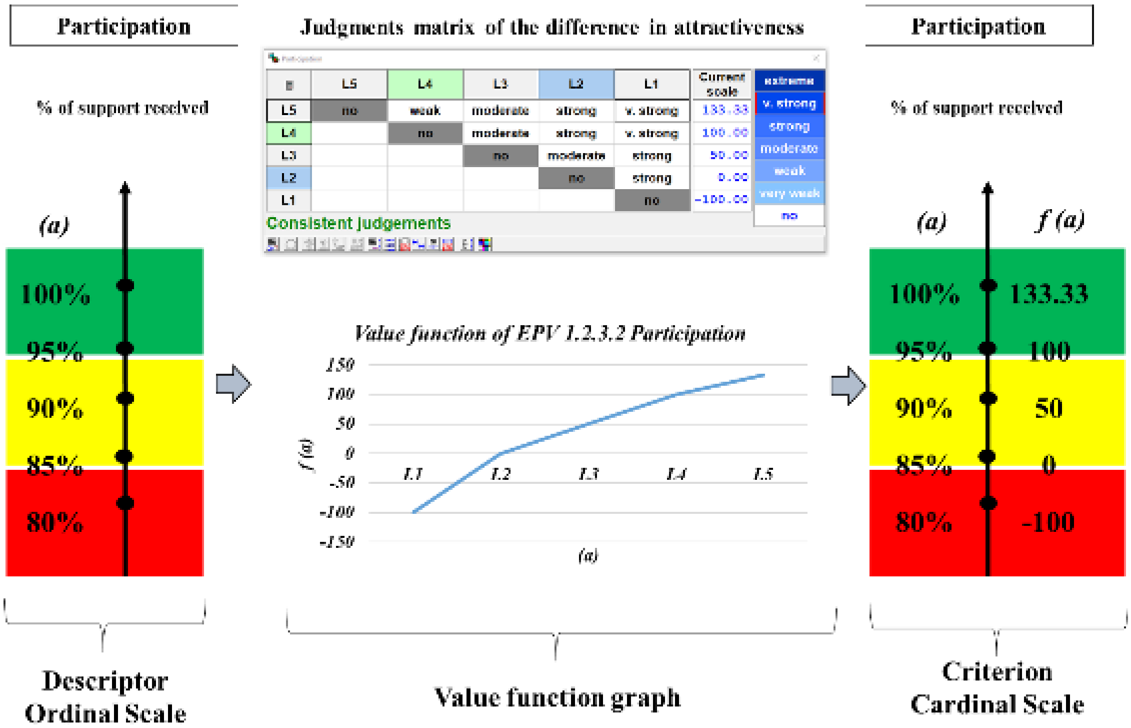

Technical Support
% of attendance of other demands
(a)
100%
95%
90%
85%
80%
Descriptor
Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
moderate
strong
v. strong
extreme
142.86
100.00
57.14
0.00
-114.29
weak
very weak
Consistent judgements
Value function of EPV 1.2.1.2 Technical Support
f (a)
200
150
100
50
0
-50
-100
-150
Value function graph
Technical Support
% of attendance of other demands
(a)
f (a)
100%
142.86
95%
100
90%
57.14
85%
0
80%
-114.29
Criterion
Cardinal Scale

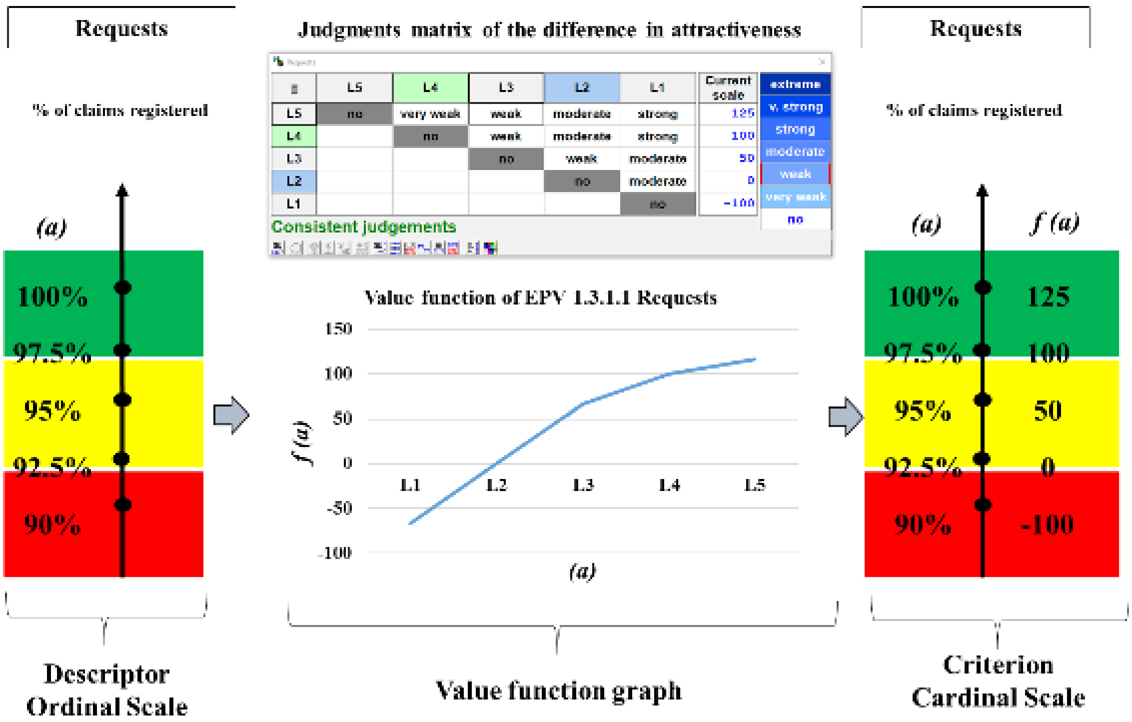

Agreements
% effectiveness of proposed agreements
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 140
L4 no weak moderate strong 100
L3 no moderate strong 60
L2 no strong 0
L1 no -120
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.2.2.1 Agreements
f (a)
(a)
L1 L2 L3 L4 L5
Value function graph
Agreements
% effectiveness of proposed agreements
(a) f (a)
100% 140
97.5% 100
95% 60
92.5% 0
90% -120
Criterion Cardinal Scale

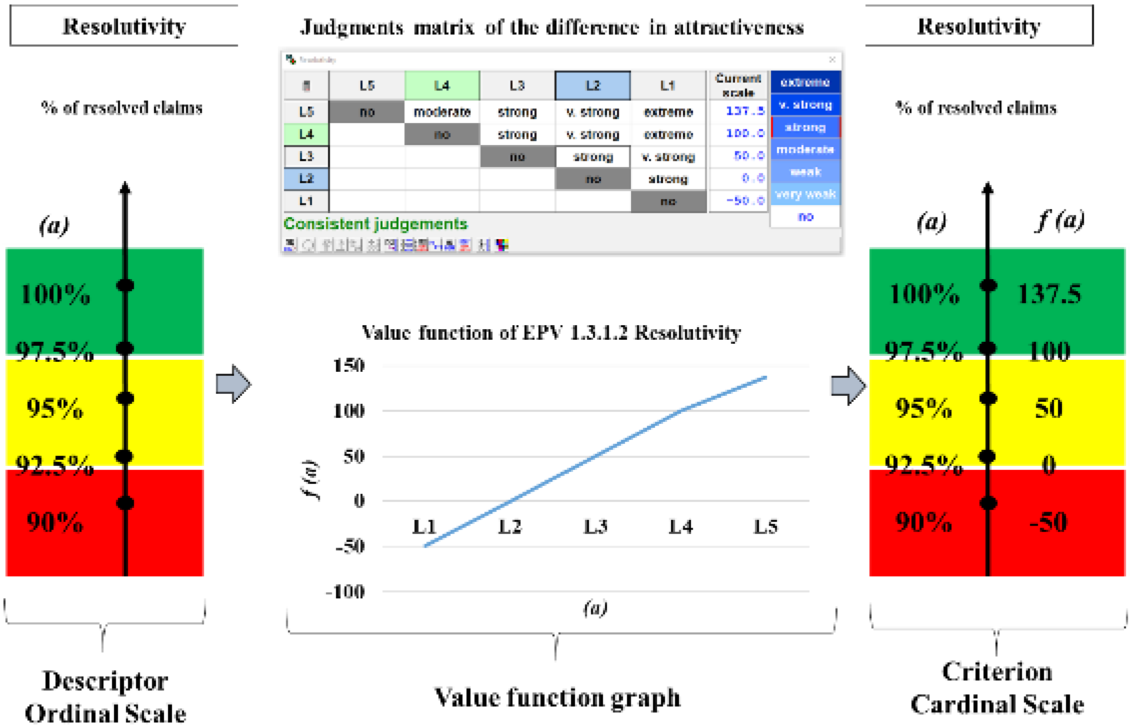

Meetings
% effectiveness of requested meetings
(a)
100%
90%
80%
75%
70%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 125
L4 no weak moderate strong 100
L3 no weak moderate 50
L2 no moderate 0
L1 no -100
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.2.2.2 Meetings
f (a)
(a)
L1 L2 L3 L4 L5
Value function graph
Meetings
% effectiveness of requested meetings
(a) f (a)
100% 125
90% 100
80% 50
75% 0
70% -100
Criterion Cardinal Scale

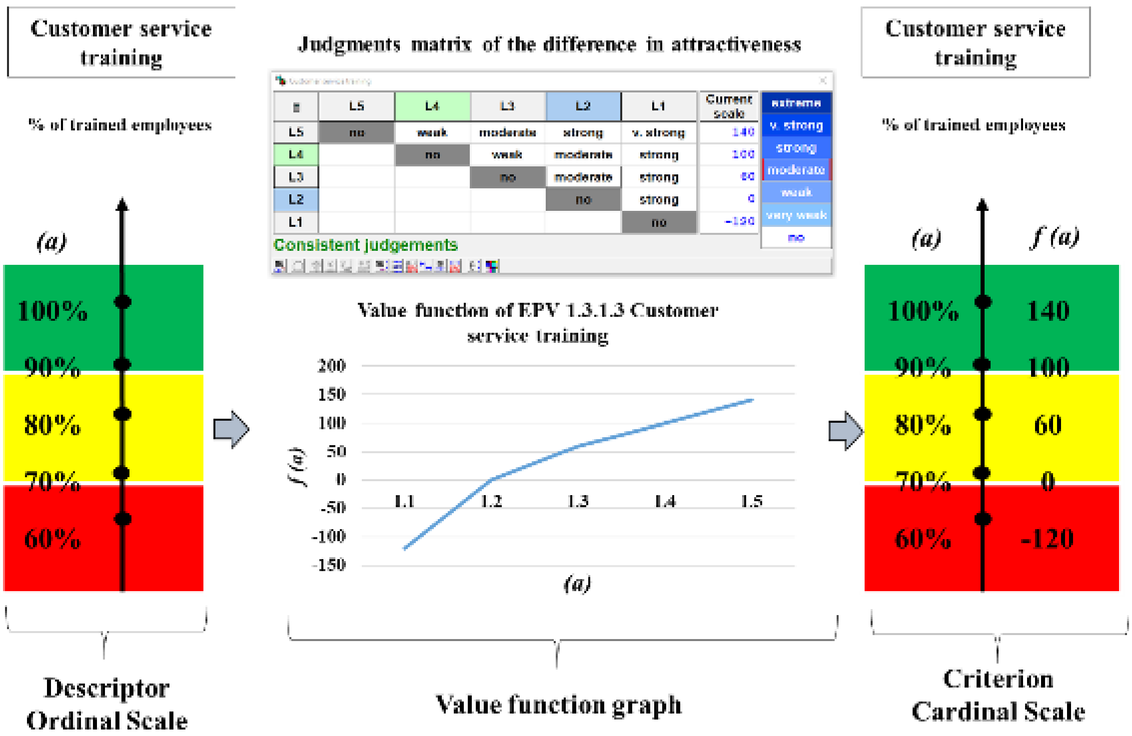

Activities
% effectiveness of actions with partners
(a)
100%
98.5%
97%
95%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 140
L4 no weak moderate strong 100
L3 no moderate strong 60
L2 no strong 0
L1 no -120
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.2.2.1 Activities
200
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Activities
% effectiveness of actions with partners
(a) f (a)
100% 140
98.5% 100
97% 60
95% 0
90% -120
Criterion Cardinal Scale

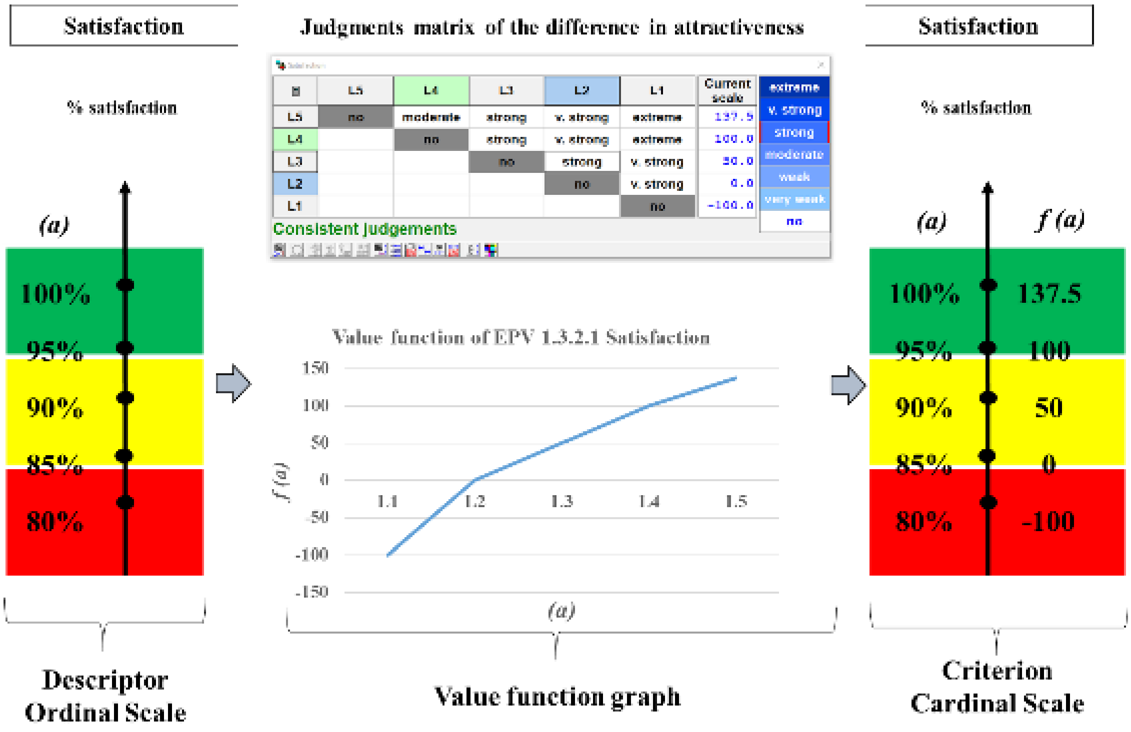

Transfers
% of deferred transfers of employees to other units
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no moderate 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.2.3.1 Transfers
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Transfers
% of deferred transfers of employees to other units
(a) f (a)
100% 116.67
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale


Participation
% of support received
(a)
100%
95%
90%
85%
80%
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.2.3.2 Participation
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Participation
% of support received
(a) f (a)
100% 133.33
95% 100
90% 50
85% 0
80% -100
Descriptor
Ordinal Scale
Value function graph
Criterion
Cardinal Scale

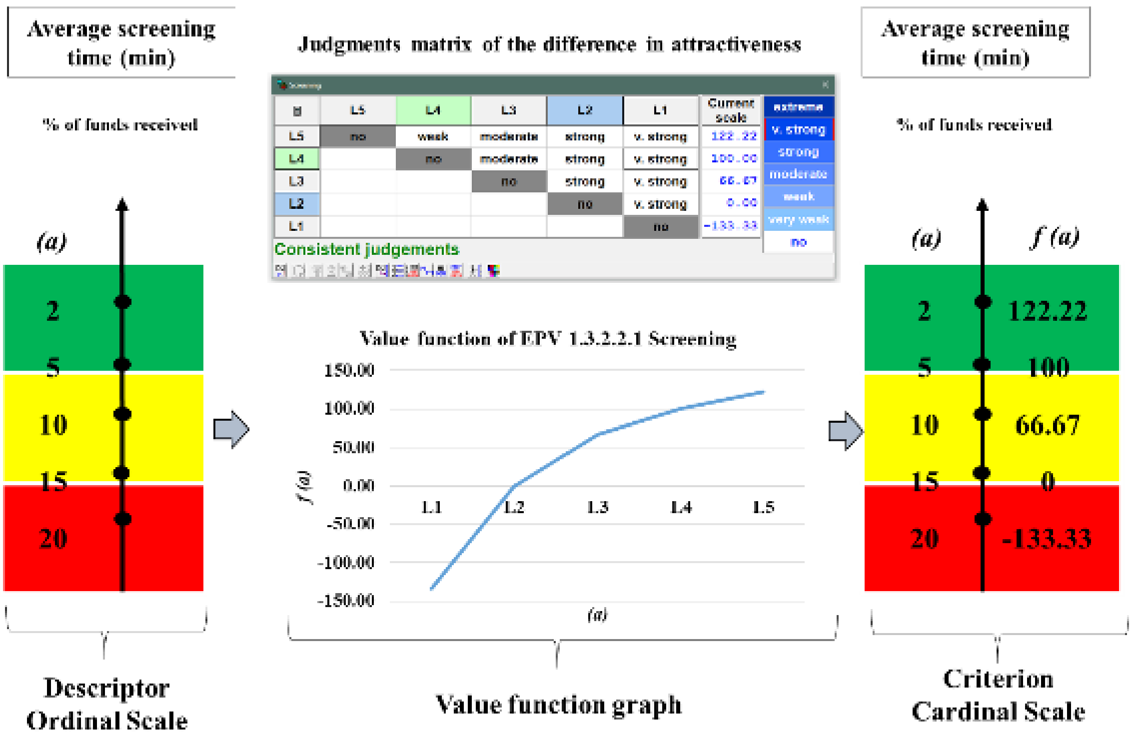

Requests
% of claims registered
(a)
100%
97.5%
95%
92.5%
90%
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 125
L4 no weak moderate strong 100
L3 no weak moderate 50
L2 no moderate 0
L1 no -100
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.3.1.1 Requests
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Requests
% of claims registered
(a) f (a)
100% 125
97.5% 100
95% 50
92.5% 0
90% -100
Descriptor
Ordinal Scale
Value function graph
Criterion
Cardinal Scale


Resolutivity
% of resolved claims
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no strong 0.0
L1 no -50.0
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.3.1.2 Resolutivity
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Resolutivity
% of resolved claims
(a) f (a)
100% 137.5
97.5% 100
95% 50
92.5% 0
90% -50
Criterion Cardinal Scale

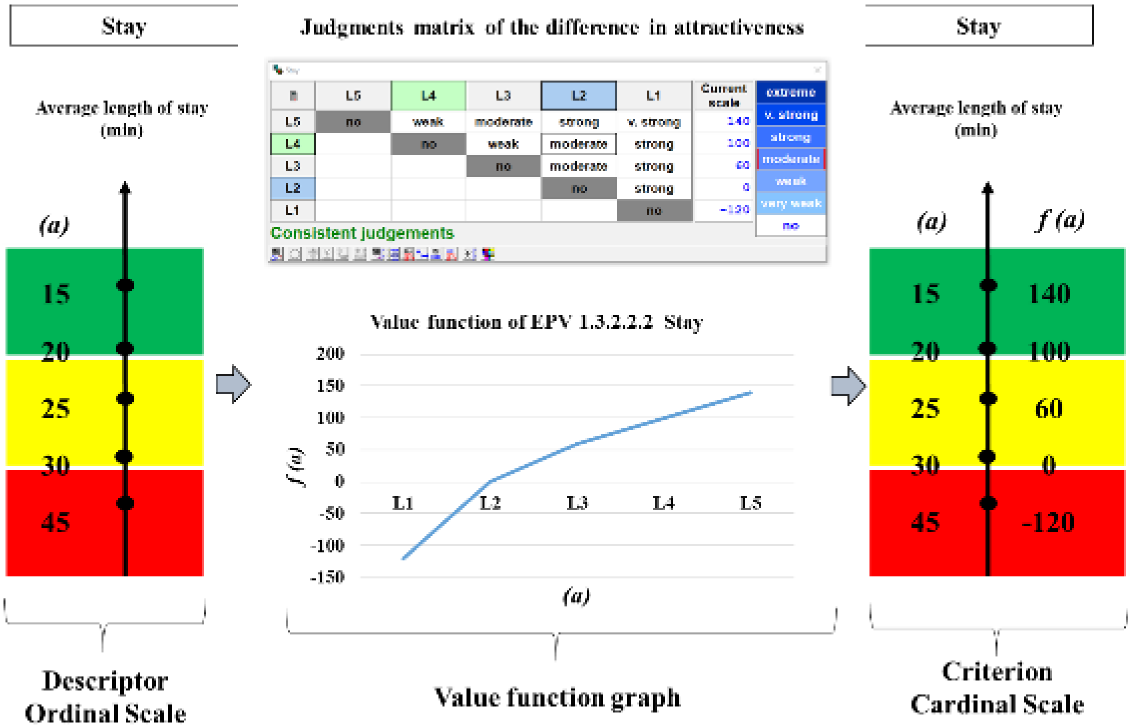

Customer service training
% of trained employees
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 140
L4 no weak moderate strong 100
L3 no moderate strong 60
L2 no strong 0
L1 no -120
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.3.1.3 Customer service training
200
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Customer service training
% of trained employees
(a) f (a)
100% 140
90% 100
80% 60
70% 0
60% -120
Criterion Cardinal Scale

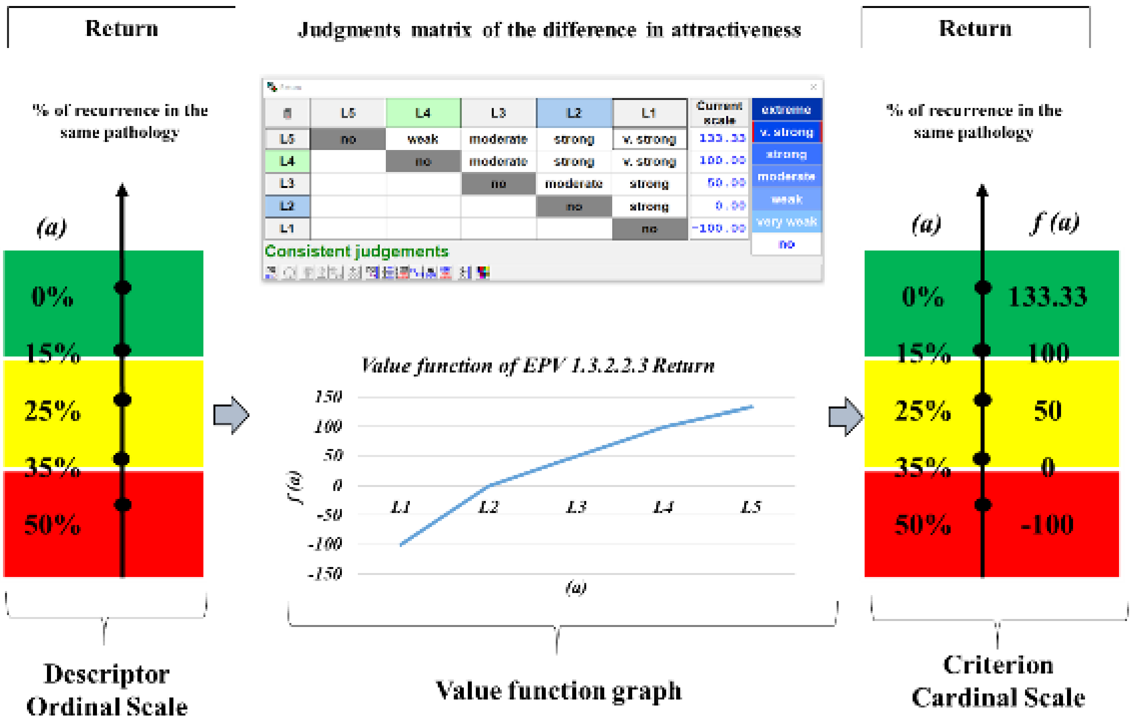


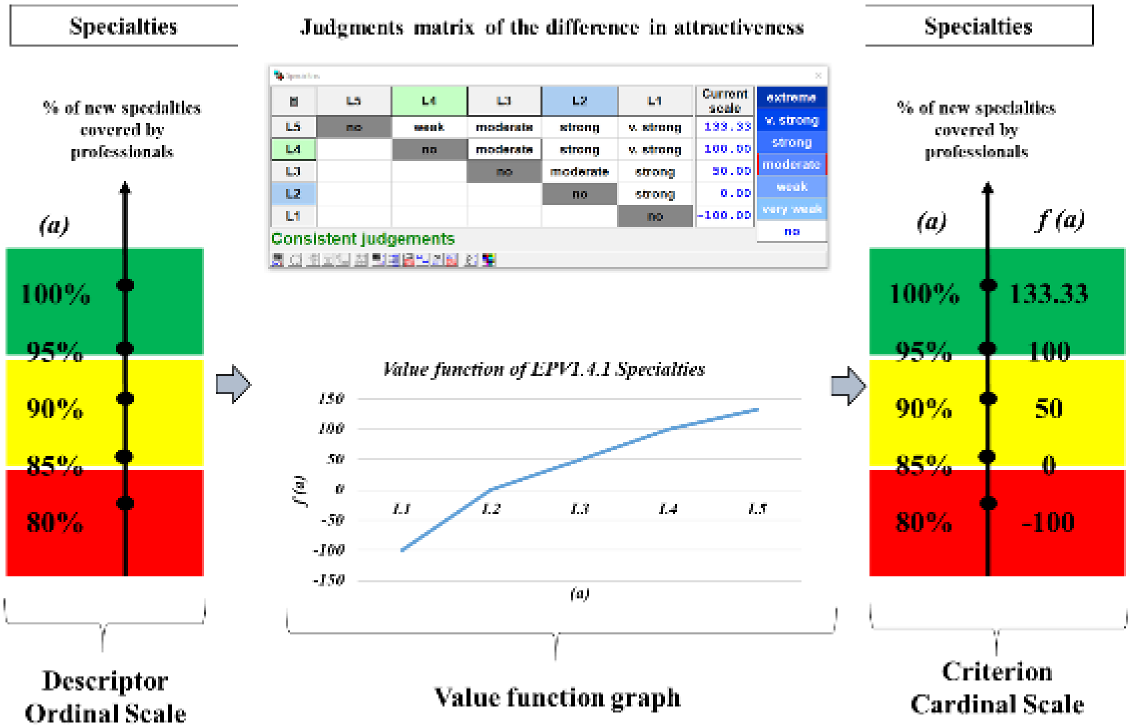
Satisfaction
Judgments matrix of the difference in attractiveness
Satisfaction
% satisfaction
% satisfaction
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -100.0
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
100%
95%
90%
85%
80%
Value function of EPV 1.3.2.1 Satisfaction
150
100
50
0
-50
-100
-150
1.1
1.2
1.3
1.4
1.5
f (a)
(a)
(a)
f (a)
100% 137.5
95% 100
90% 50
85% 0
80% -100
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

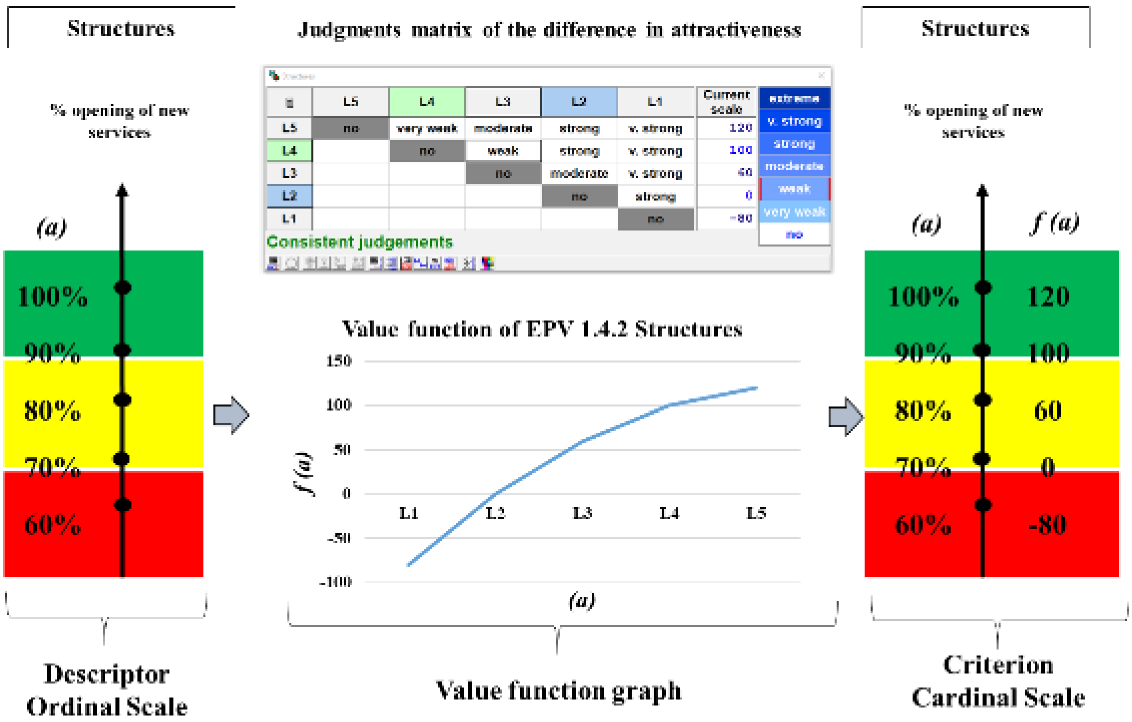


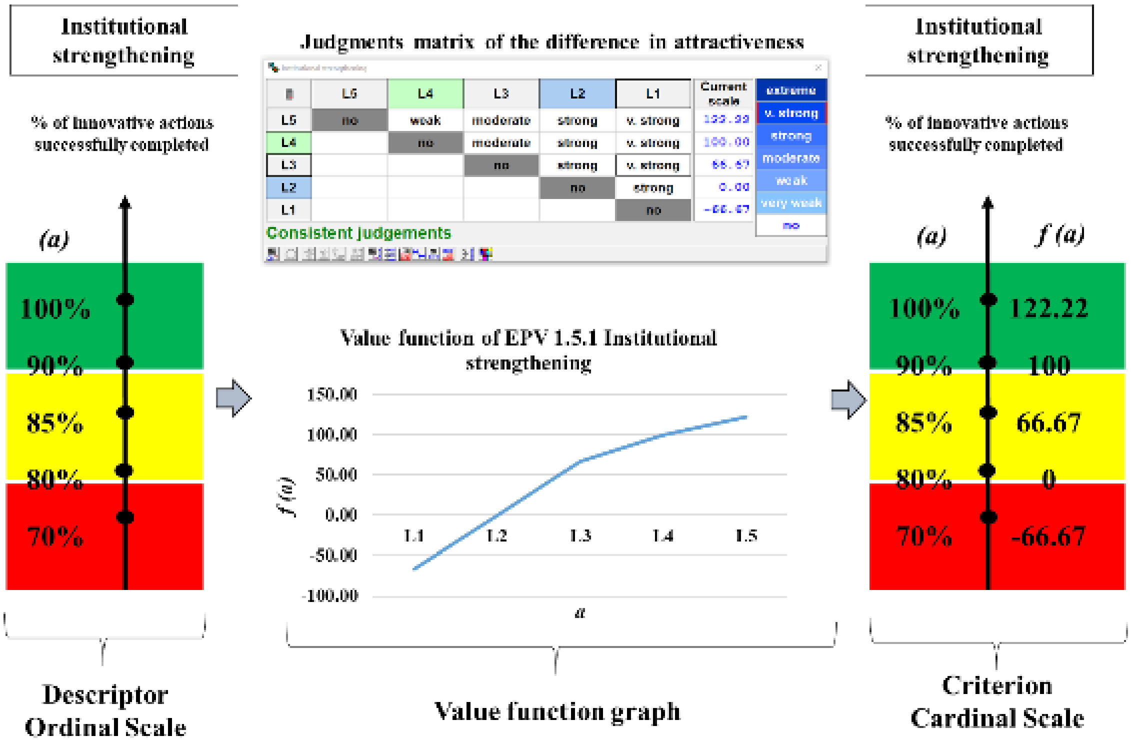
Average screening time (min)
Judgments matrix of the difference in attractiveness
Average screening time (min)
% of funds received
% of funds received
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
2
5
10
15
20
Value function of EPV 1.3.2.2.1 Screening
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
1.1
1.2
1.3
1.4
1.5
f (a)
(a)
(a)
f (a)
2 122.22
5 100
10 66.67
15 0
20 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

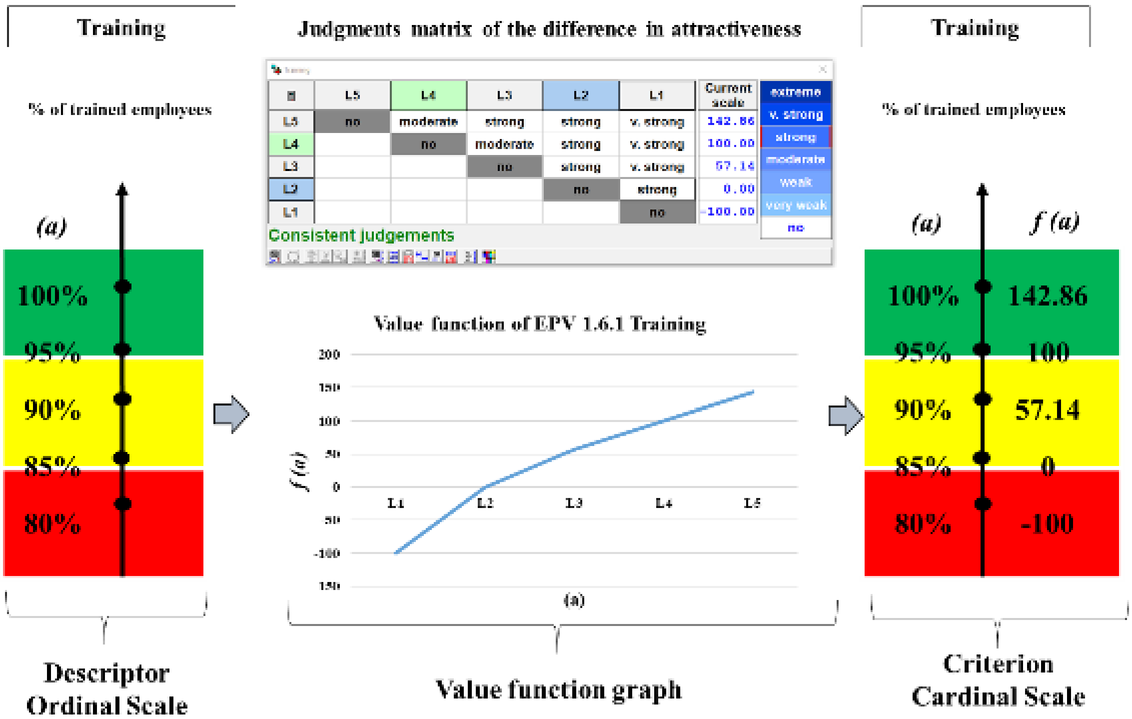

Stay
Judgments matrix of the difference in attractiveness
Stay
Average length of stay (min)
Average length of stay (min)
(a)
15
20
25
30
45
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 140
L4 no weak moderate strong 100
L3 no moderate strong 60
L2 no strong 0
L1 no -120
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.3.2.2.2 Stay
200
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
15 140
20 100
25 60
30 0
45 -120
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

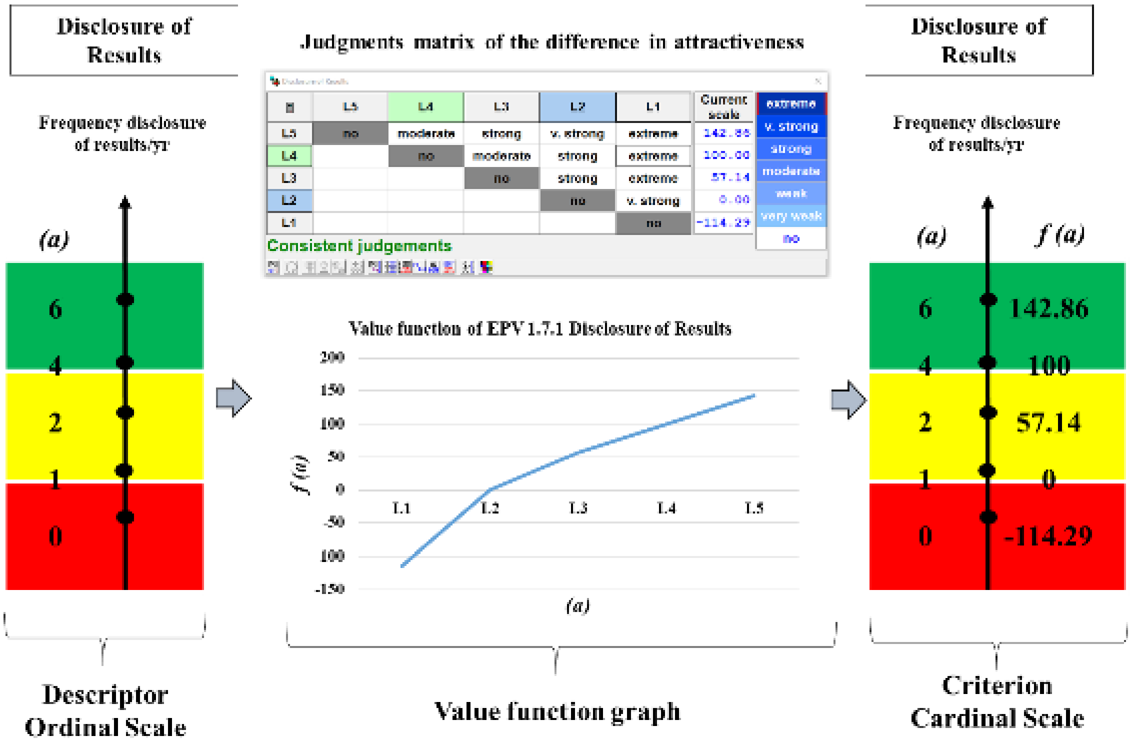

Return
Judgments matrix of the difference in attractiveness
Return
% of recurrence in the same pathology
% of recurrence in the same pathology
(a)
0%
15%
25%
35%
50%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.3.2.2.3 Return
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
0% 133.33
15% 100
25% 50
35% 0
50% -100
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Specialties
Judgments matrix of the difference in attractiveness
Specialties
% of new specialties covered by professionals
(a)
100%
95%
90%
85%
80%
Consistent judgements
Value function of EPV1.4.1 Specialties
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
(a)
% of new specialties covered by professionals
(a)
f (a)
100%
133.33
95%
100
90%
50
85%
0
80%
-100
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

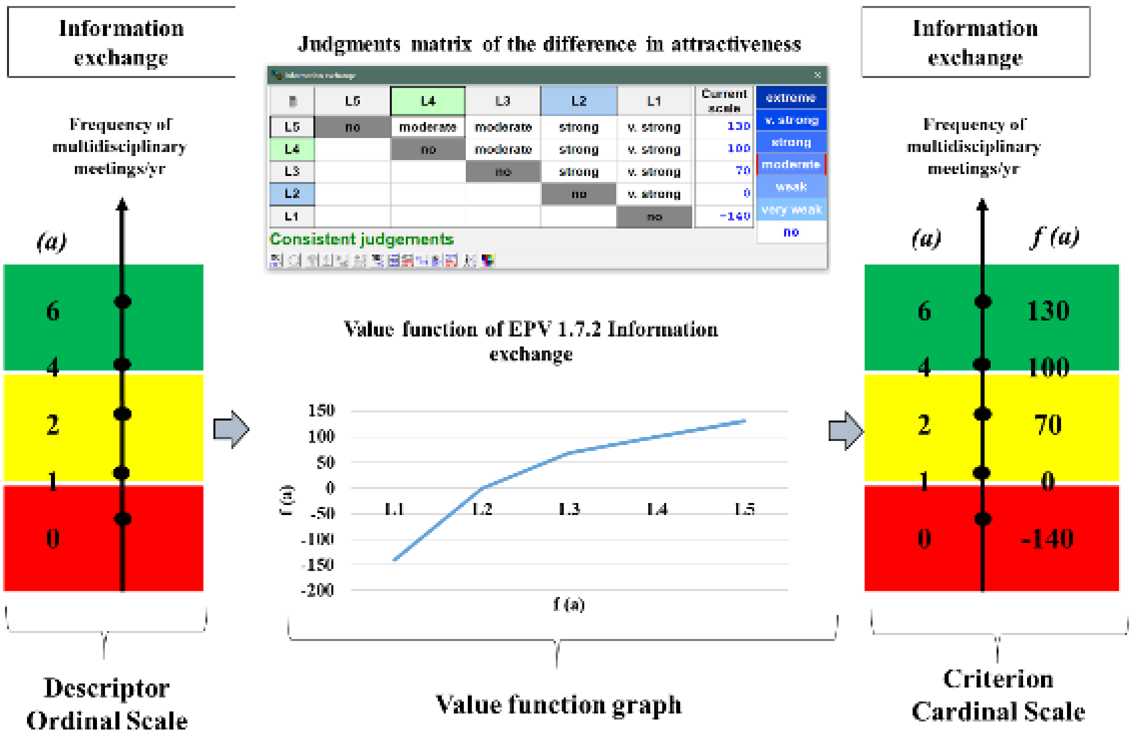

Structures
Judgments matrix of the difference in attractiveness
Structures
% opening of new services
(a)
100%
90%
80%
70%
60%
Consistent judgements
Value function of EPV 1.4.2 Structures
150
100
50
0
-50
-100
f (a)
L1
L2
L3
L4
L5
(a)
% opening of new services
(a)
f (a)
100%
120
90%
100
80%
60
70%
0
60%
-80
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Institutional strengthening
% of innovative actions successfully completed
(a)
100%
90%
85%
80%
70%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.5.1 Institutional strengthening
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
L1 L2 L3 L4 L5
a
Value function graph
Institutional strengthening
% of innovative actions successfully completed
(a) f (a)
100% 122.22
90% 100
85% 66.67
80% 0
70% -66.67
Criterion Cardinal Scale

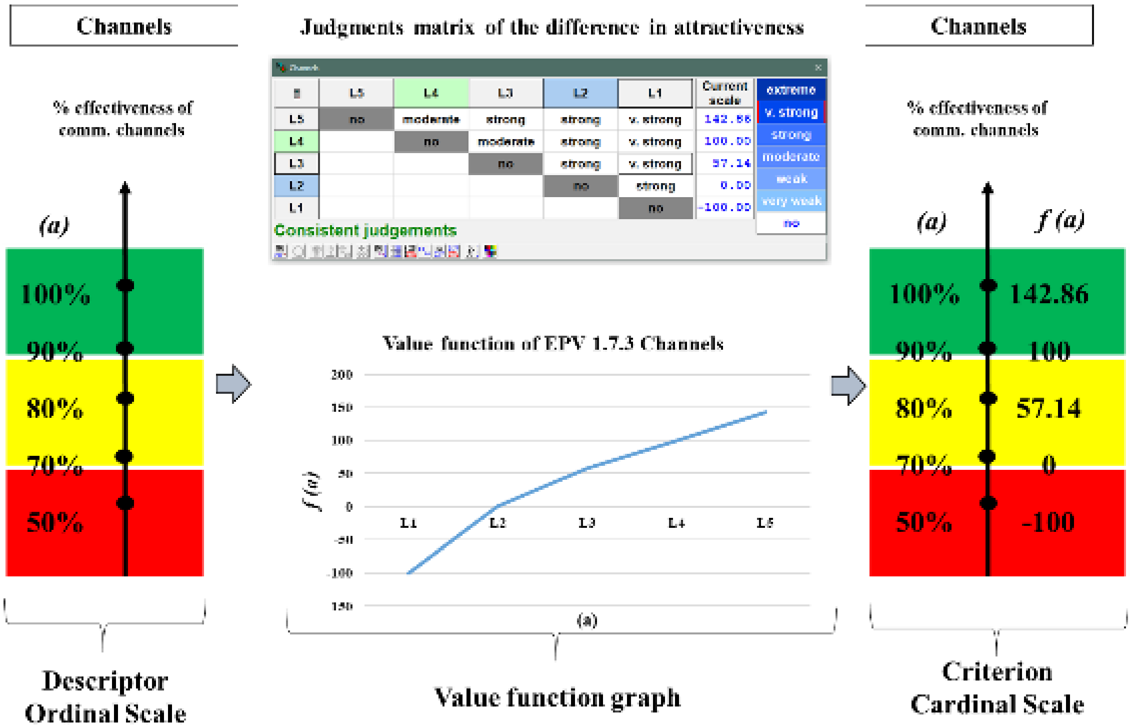

Training
% of trained employees
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong strong v. strong 142.86
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 57.14
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.6.1 Training
200
150
100
50
0
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Training
% of trained employees
(a) f (a)
100% 142.86
95% 100
90% 57.14
85% 0
80% -100
Criterion Cardinal Scale

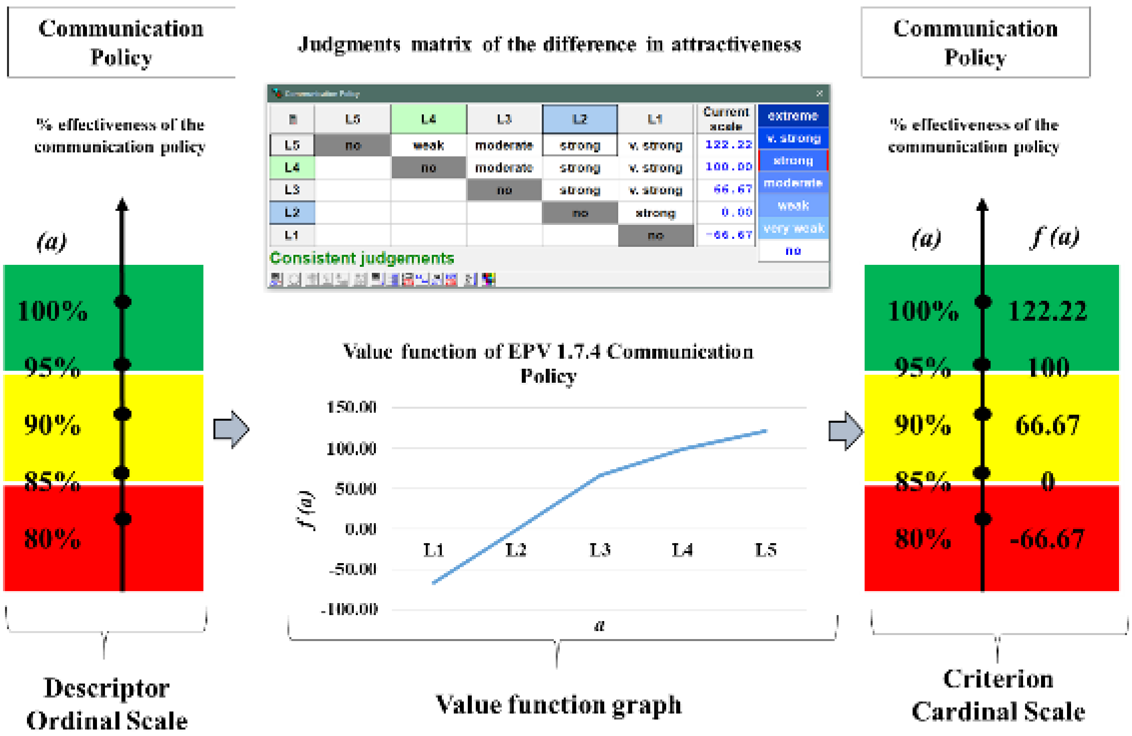


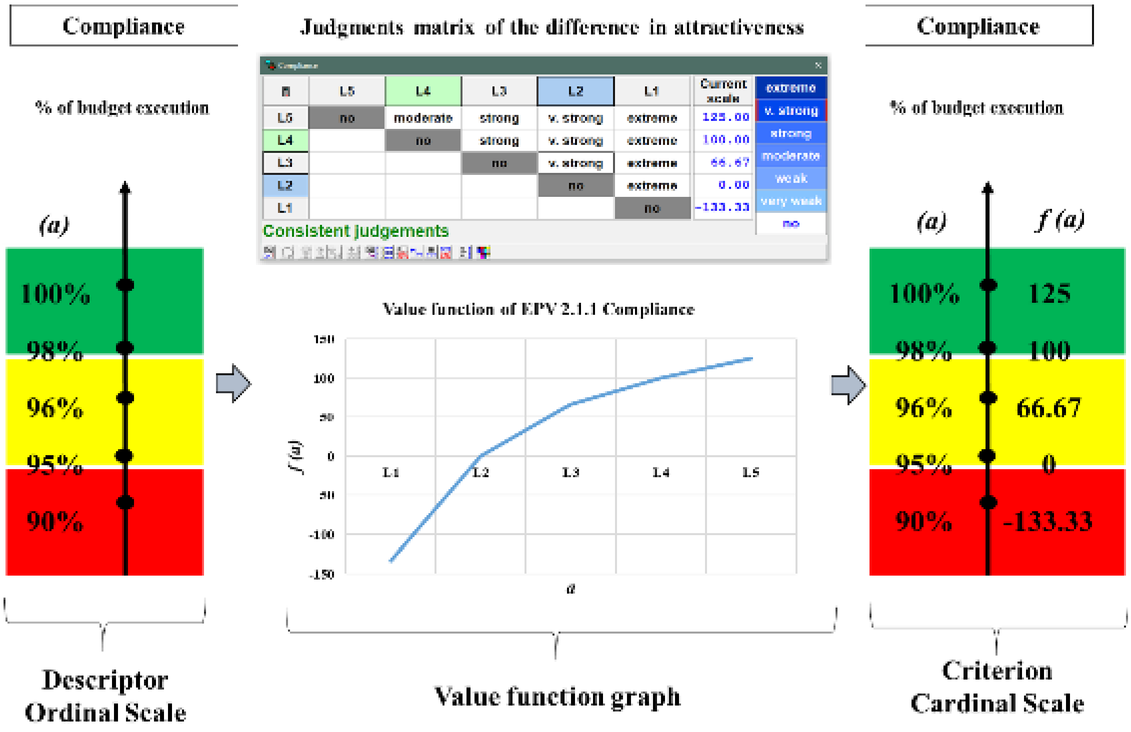
Disclosure of Results
Frequency disclosure of results/yr
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 142.86
L4 no moderate strong extreme 100.00
L3 no strong extreme 57.14
L2 no v. strong 0.00
L1 no -114.29
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 1.7.1 Disclosure of Results
200 150 100 50 0 -50 100 -150
L1 L2 L3 L4 L5
f (a)
(a)
6 4 2 1 0
142.86 100 57.14 0 -114.29
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

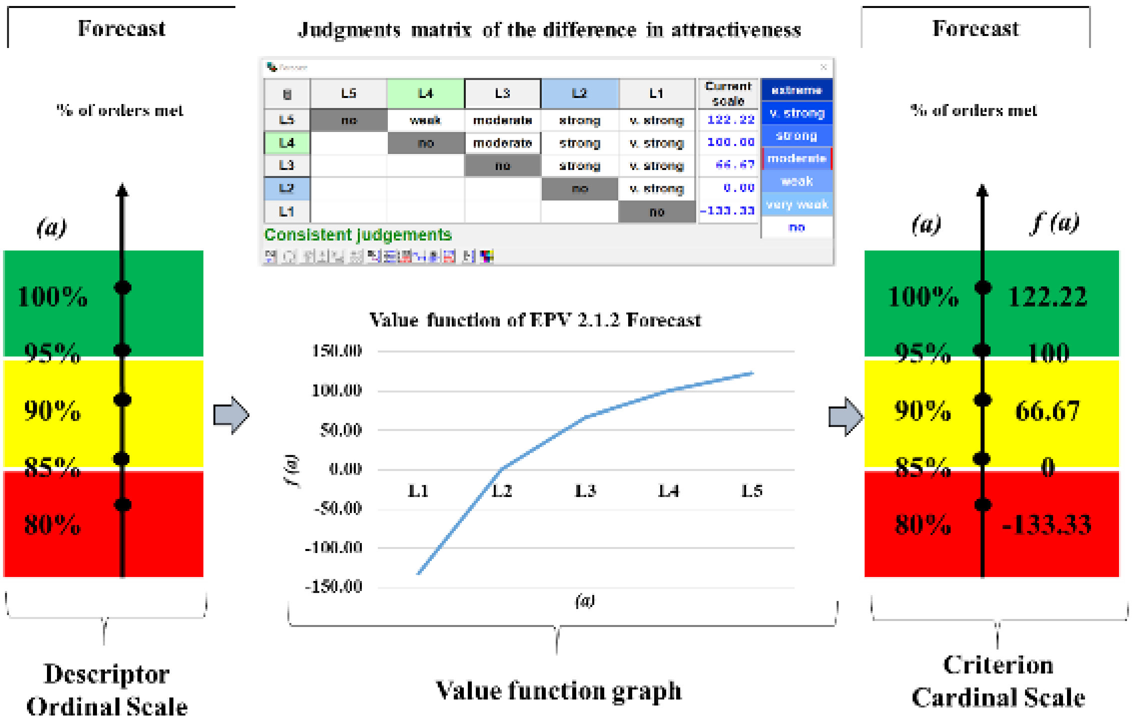


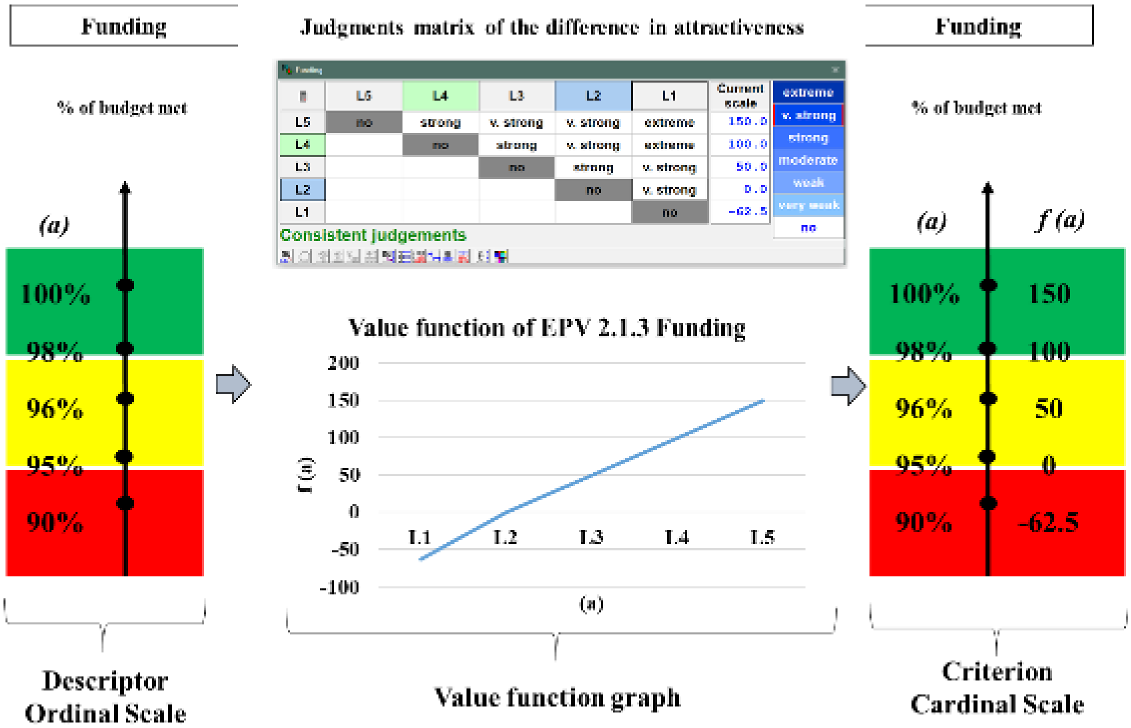
Information exchange
Frequency of multidisciplinary meetings/yr
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate moderate strong v. strong 130
L4 no moderate strong v. strong 100
L3 no strong v. strong 70
L2 no v. strong 0
L1 no -140
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 1.7.2 Information exchange
150 100 50 0 -50 -100 -150 -200
L1 L2 L3 L4 L5
f (a)
(a)
6 4 2 1 0
130 100 70 0 -140
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Channels
% effectiveness of comm. channels
(a)
100%
90%
80%
70%
50%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong strong v. strong 142.86
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 57.14
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.7.3 Channels
200
150
100
50
0
-50
-100
-150
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Channels
% effectiveness of comm. channels
(a) f (a)
100% 142.86
90% 100
80% 57.14
70% 0
50% -100
Criterion Cardinal Scale

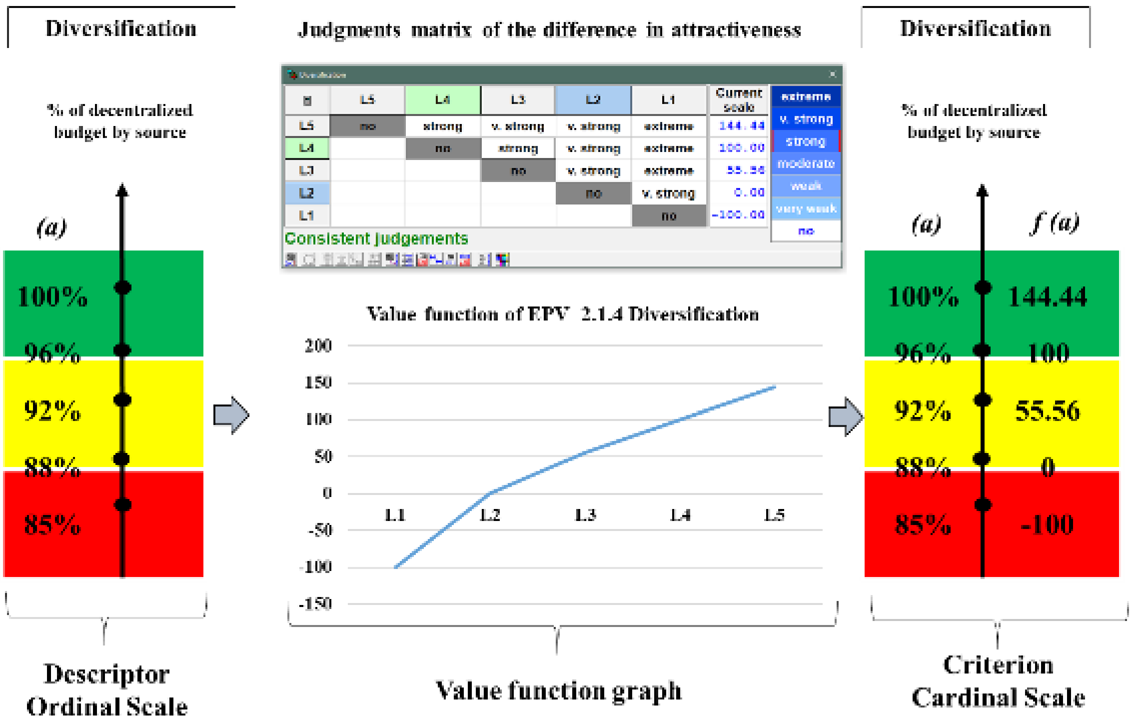

Communication Policy
% effectiveness of the communication policy
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 1.7.4 Communication Policy
150.00
100.00
50.00
0.00
-50.00
-100.00
L1 L2 L3 L4 L5
f (a)
a
Value function graph
Communication Policy
% effectiveness of the communication policy
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale


Compliance
Judgments matrix of the difference in attractiveness
Compliance
% of budget execution
% of budget execution
(a)
100%
98%
96%
95%
90%
Compliance
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.1.1 Compliance
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
a
(a) f (a)
100% 125
98% 100
96% 66.67
95% 0
90% -133.33
Descriptor
Ordinal Scale
Value function graph
Criterion
Cardinal Scale

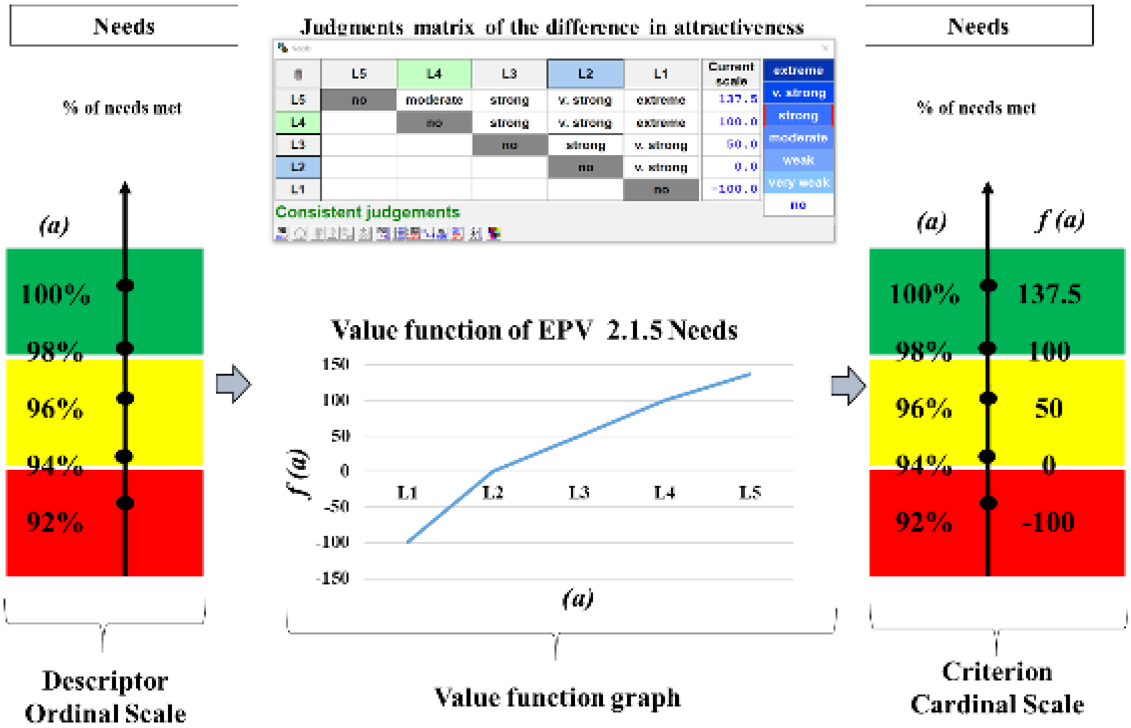

Forecast
Judgments matrix of the difference in attractiveness
Forecast
% of orders met
% of orders met
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.1.2 Forecast
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor
Ordinal Scale
Value function graph
Criterion
Cardinal Scale

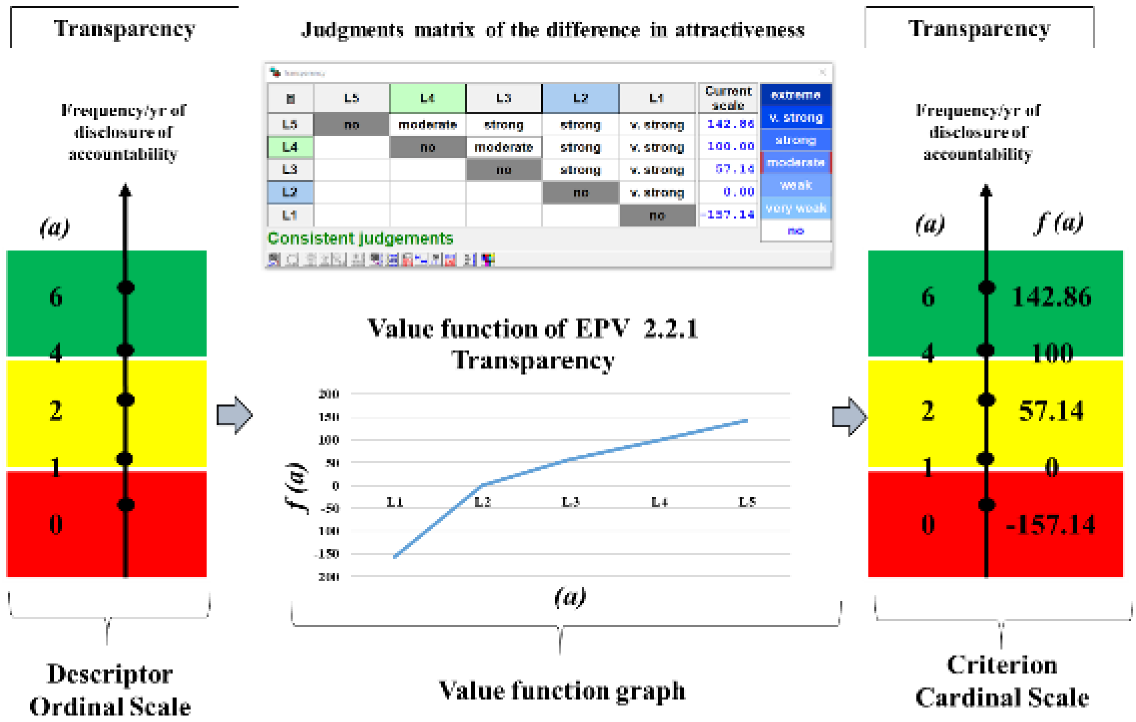


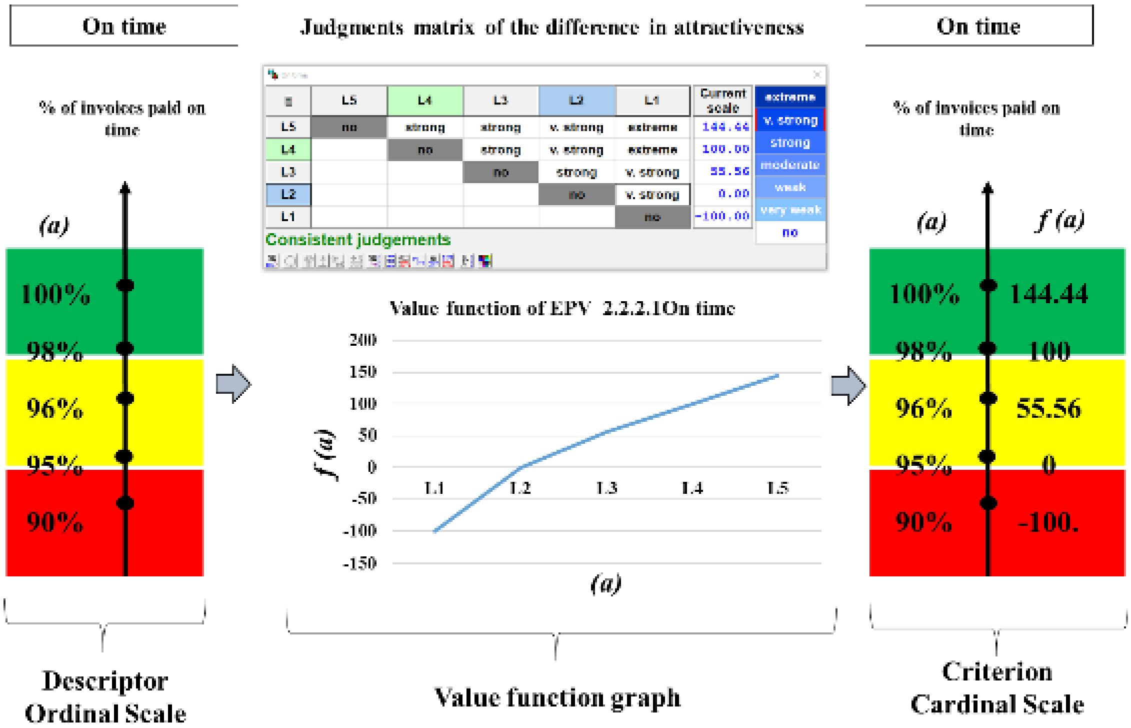
	L5	L4	L3	L2	L1	Current scale
L5	no	strong	v. strong	v. strong	extreme	150.0
L4		no	strong	v. strong	extreme	100.0
L3			no	strong	v. strong	50.0
L2				no	v. strong	0.0
L1					no	-62.5

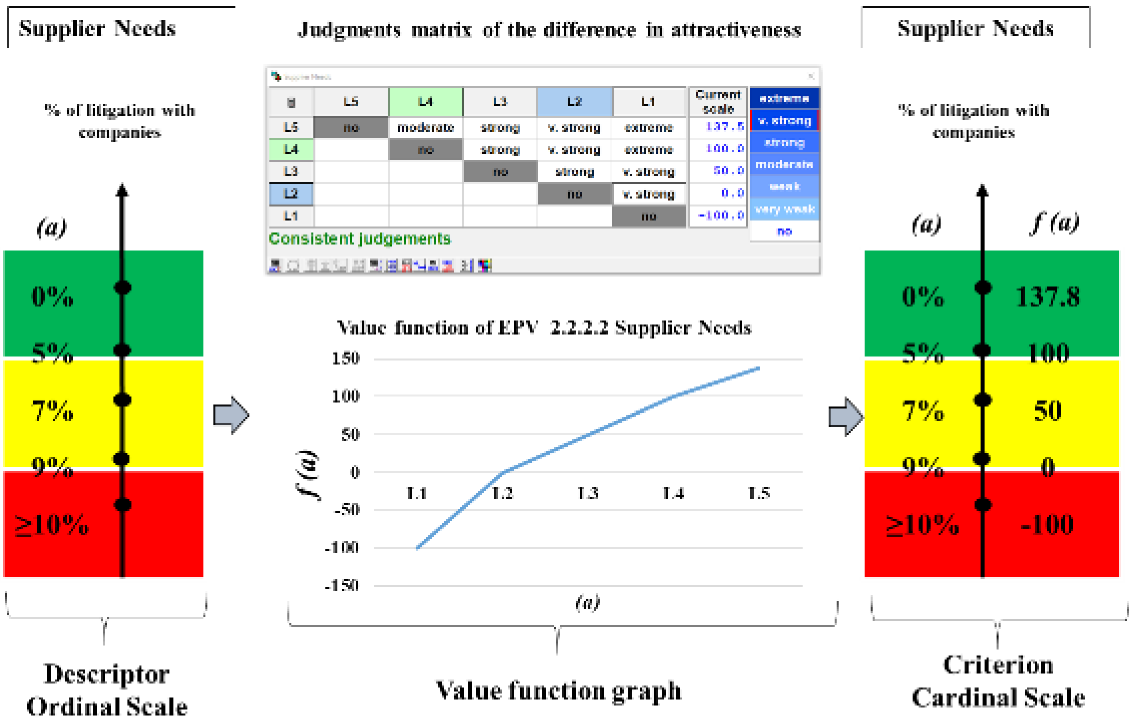


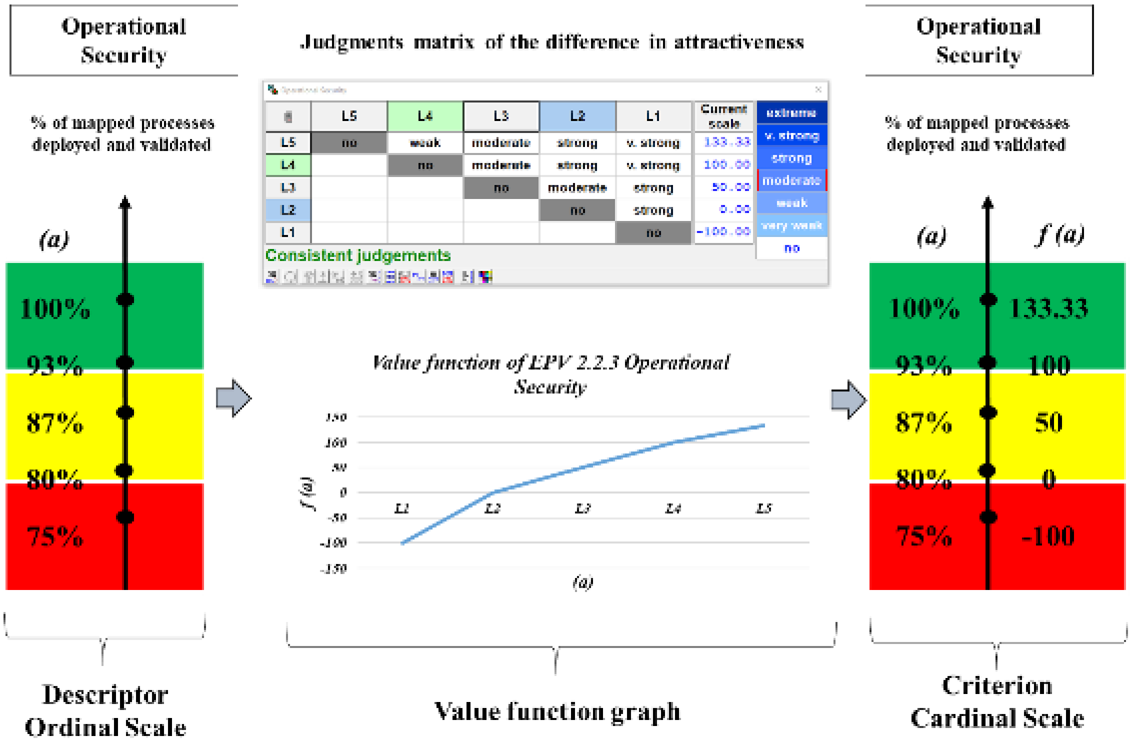
	L5	L4	L3	L2	L1	Current scale
L5	no	strong	v. strong	v. strong	extreme	144.44
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	55.56
L2				no	v. strong	0.00
L1					no	-100.00

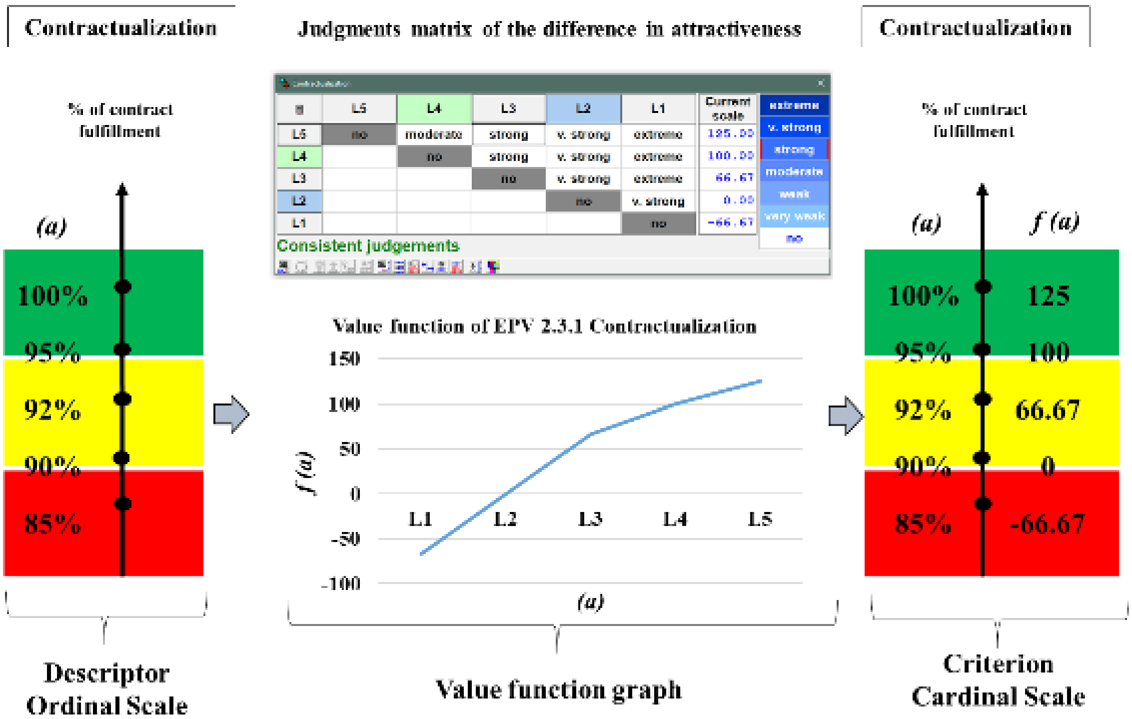

Needs
% of needs met
(a)
100%
98%
96%
94%
92%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -100.0
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.1.5 Needs
150
100
50
0
-50
-100
-150
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Needs
% of needs met
(a) f (a)
100% 137.5
98% 100
96% 50
94% 0
92% -100
Criterion Cardinal Scale

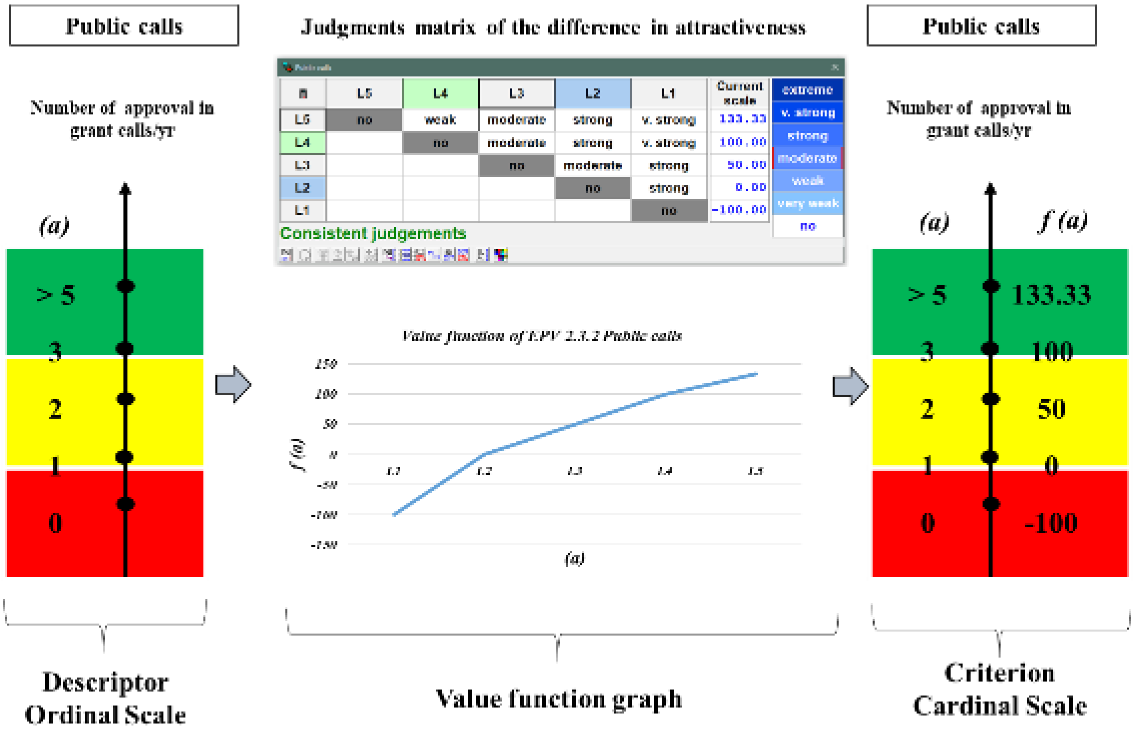

Transparency
Frequency/yr of disclosure of accountability
(a)
6
4
2
1
0
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong strong v. strong 142.86
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 57.14
L2 no v. strong 0.00
L1 no -157.14
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.2.1 Transparency
200
150
100
50
0
-50
-100
-150
-200
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Transparency
Frequency/yr of disclosure of accountability
(a) f (a)
6 142.86
4 100
2 57.14
1 0
0 -157.14
Criterion Cardinal Scale


On time
% of invoices paid on time
(a)
100%
98%
96%
95%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no strong strong v. strong extreme 144.44
L4 no strong v. strong extreme 100.00
L3 no strong v. strong 55.56
L2 no v. strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.2.2.1On time
200
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
On time
% of invoices paid on time
(a) f (a)
100% 144.44
98% 100
96% 55.56
95% 0
90% -100.
Criterion Cardinal Scale

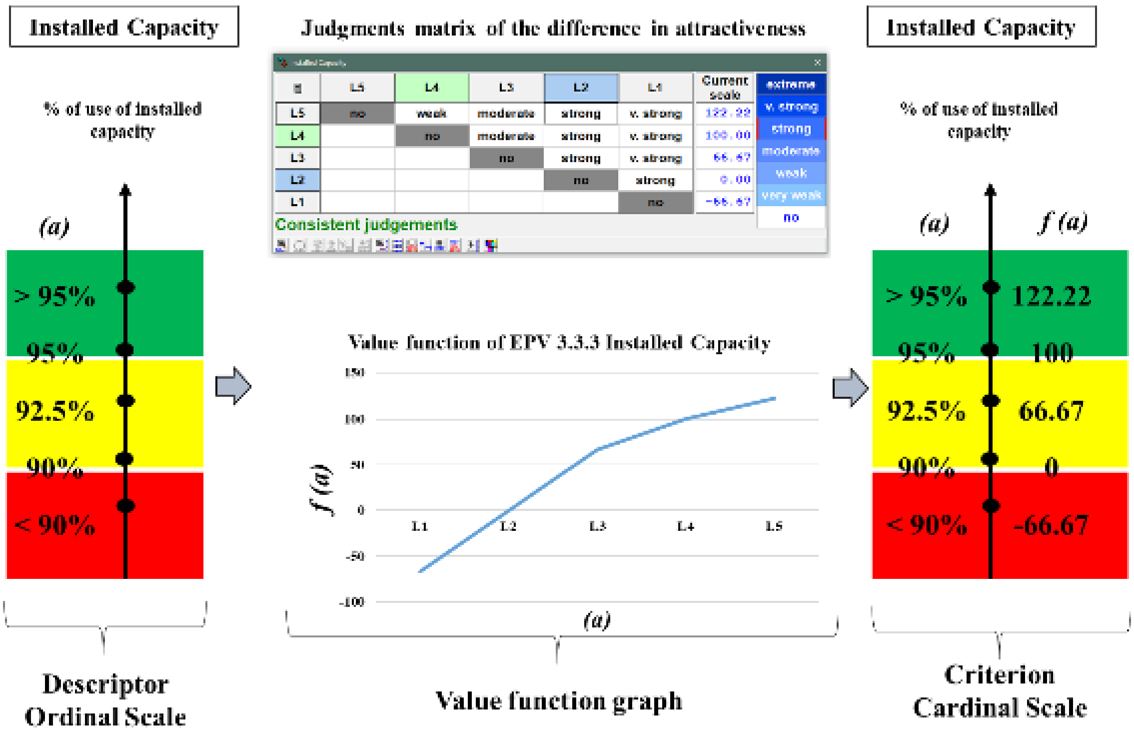

Supplier Needs
% of litigation with companies
(a)
0%
5%
7%
9%
≥10%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -100.0
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.2.2.2 Supplier Needs
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Supplier Needs
% of litigation with companies
(a) f (a)
0% 137.8
5% 100
7% 50
9% 0
≥10% -100
Criterion Cardinal Scale


Operational Security
% of mapped processes deployed and validated
(a)
100%
93%
87%
80%
75%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	133.33
L4		no	moderate	strong	v. strong	100.00
L3			no	moderate	strong	50.00
L2				no	strong	0.00
L1					no	-100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.2.3 Operational Security
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
(a)
Value function graph
Operational Security
% of mapped processes deployed and validated
(a)
f (a)
100%
133.33
93%
100
87%
50
80%
0
75%
-100
Criterion Cardinal Scale

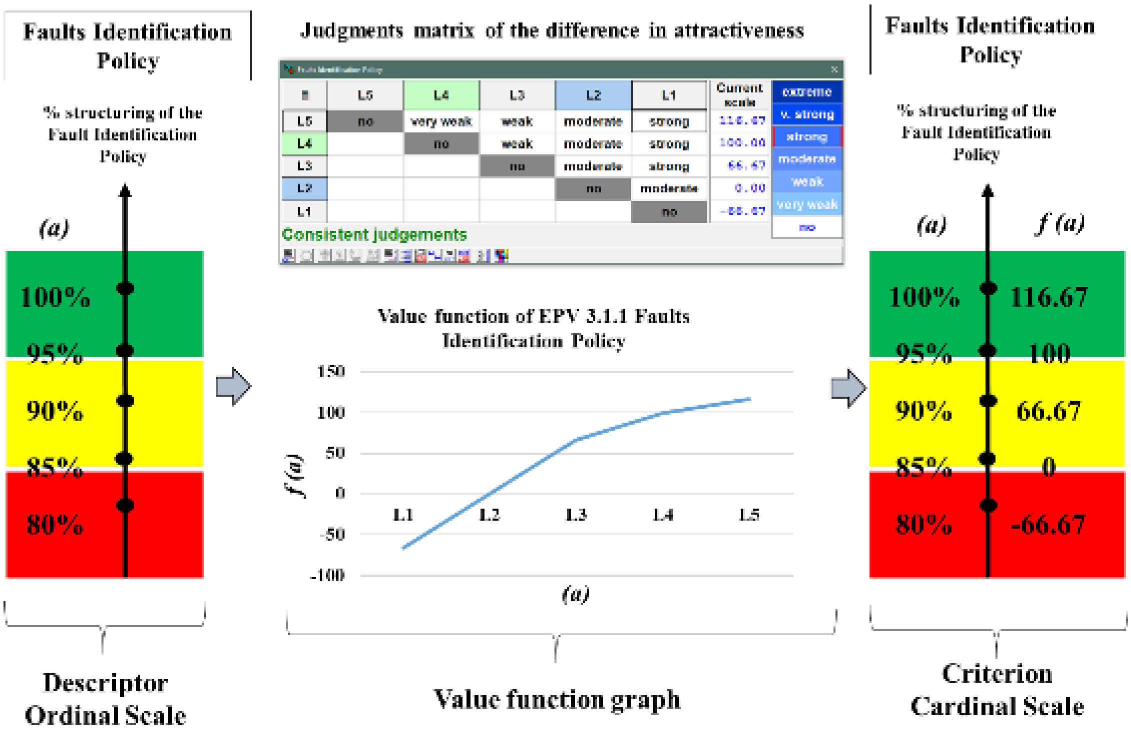

Contractualization
% of contract fulfillment
(a)
100%
95%
92%
90%
85%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	v. strong	0.00
L1					no	-66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 2.3.1 Contractualization
150
100
50
0
-50
-100
f (a)
L1
L2
L3
L4
L5
(a)
Value function graph
Contractualization
% of contract fulfillment
(a)
f (a)
100%
125
95%
100
92%
66.67
90%
0
85%
-66.67
Criterion Cardinal Scale

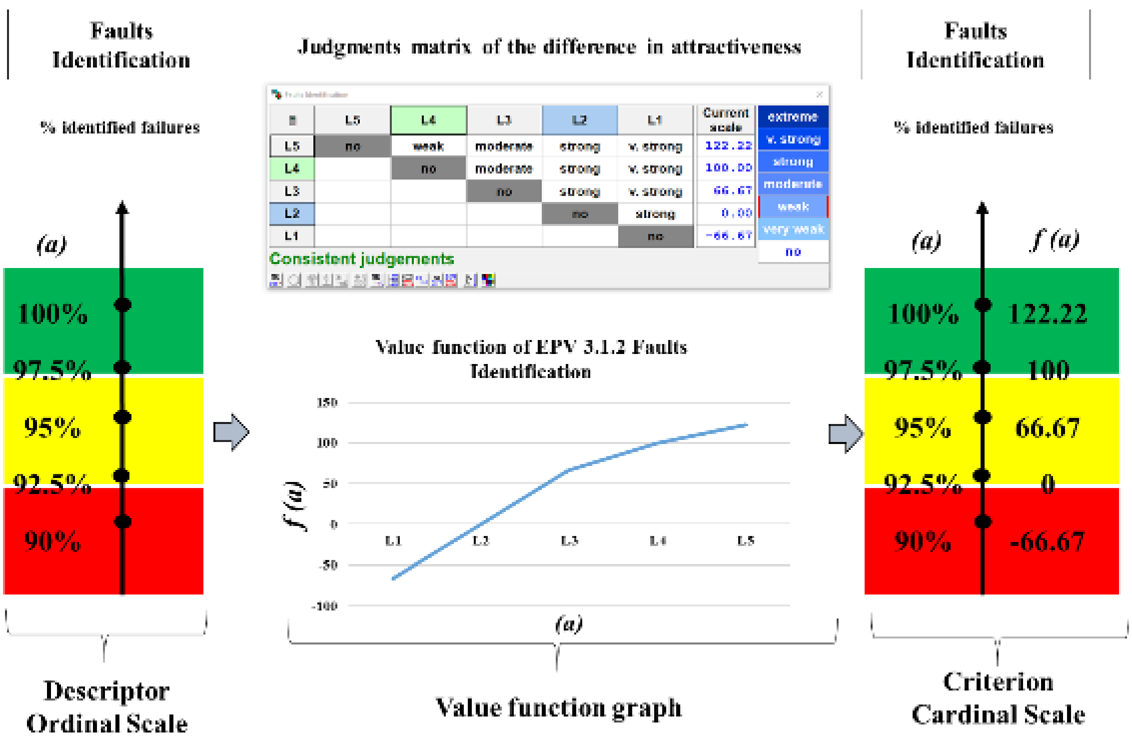


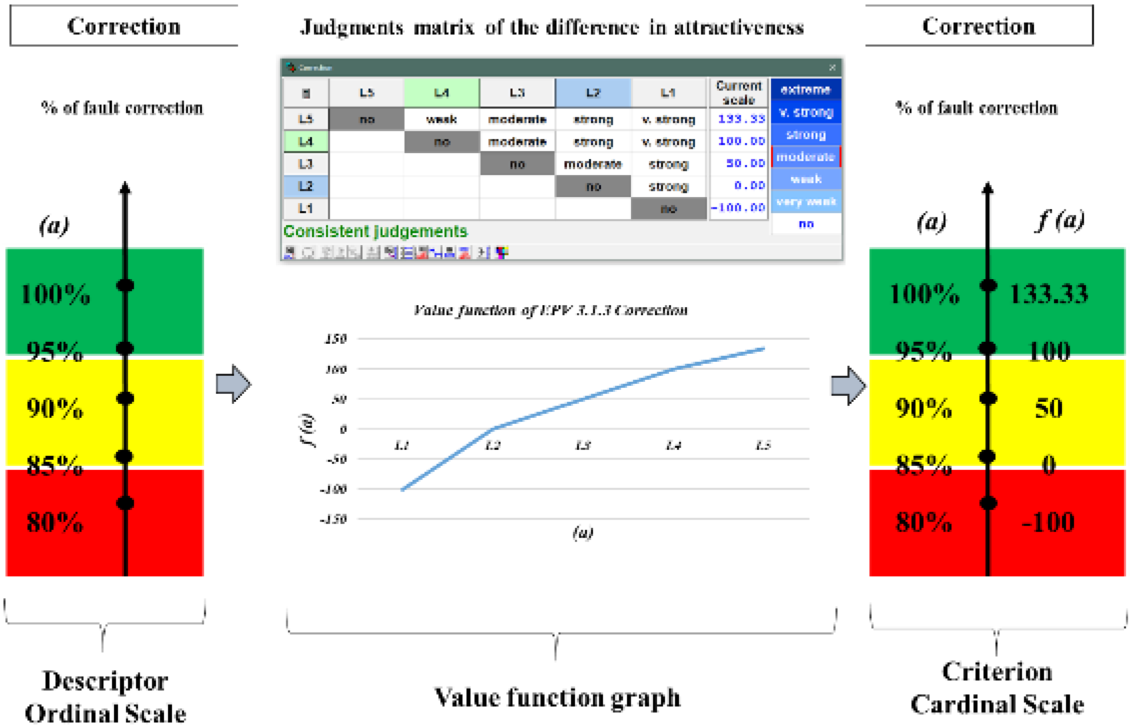
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	133.33
L4		no	moderate	strong	v. strong	100.00
L3			no	moderate	strong	50.00
L2				no	strong	0.00
L1					no	-100.00



	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	strong	0.00
L1					no	-66.67


Faults Identification Policy
% structuring of the Fault Identification Policy
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no moderate 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 3.1.1 Faults Identification Policy
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Faults Identification Policy
% structuring of the Fault Identification Policy
(a) f (a)
100% 116.67
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale

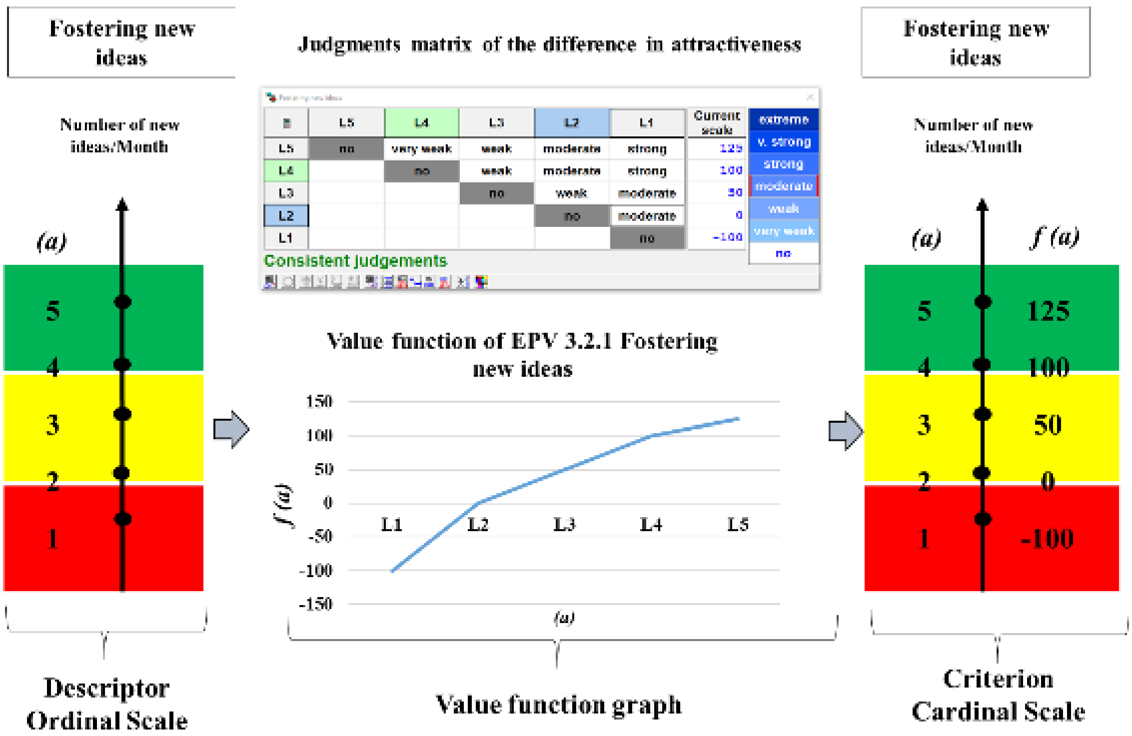

Faults Identification
% identified failures
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 3.1.2 Faults Identification
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Faults Identification
% identified failures
(a) f (a)
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -66.67
Criterion Cardinal Scale



	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	133.33
L4		no	moderate	strong	v. strong	100.00
L3			no	moderate	strong	50.00
L2				no	strong	0.00
L1					no	-100.00

extreme, v. strong, strong, moderate, weak, very weak, no

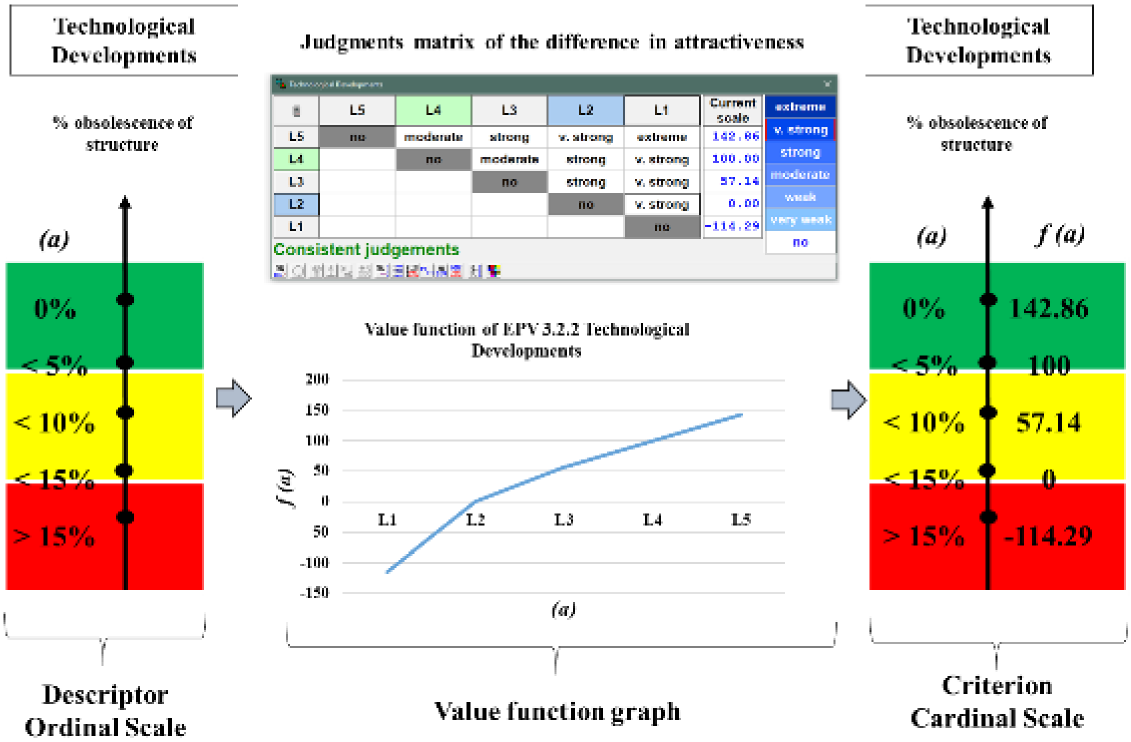
Consistent judgements



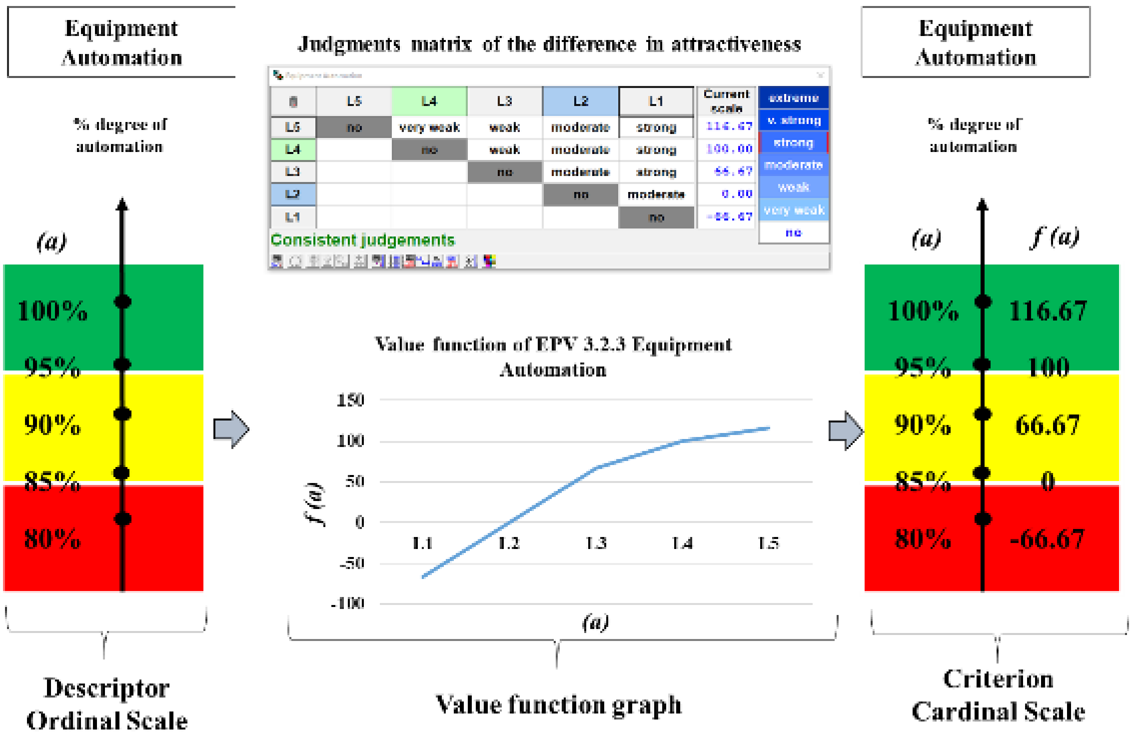
	L5	L4	L3	L2	L1	Current scale
L5	no	very weak	weak	moderate	strong	125
L4		no	weak	moderate	strong	100
L3			no	weak	moderate	50
L2				no	moderate	0
L1					no	-100

extreme, v. strong, strong, moderate, weak, very weak, no

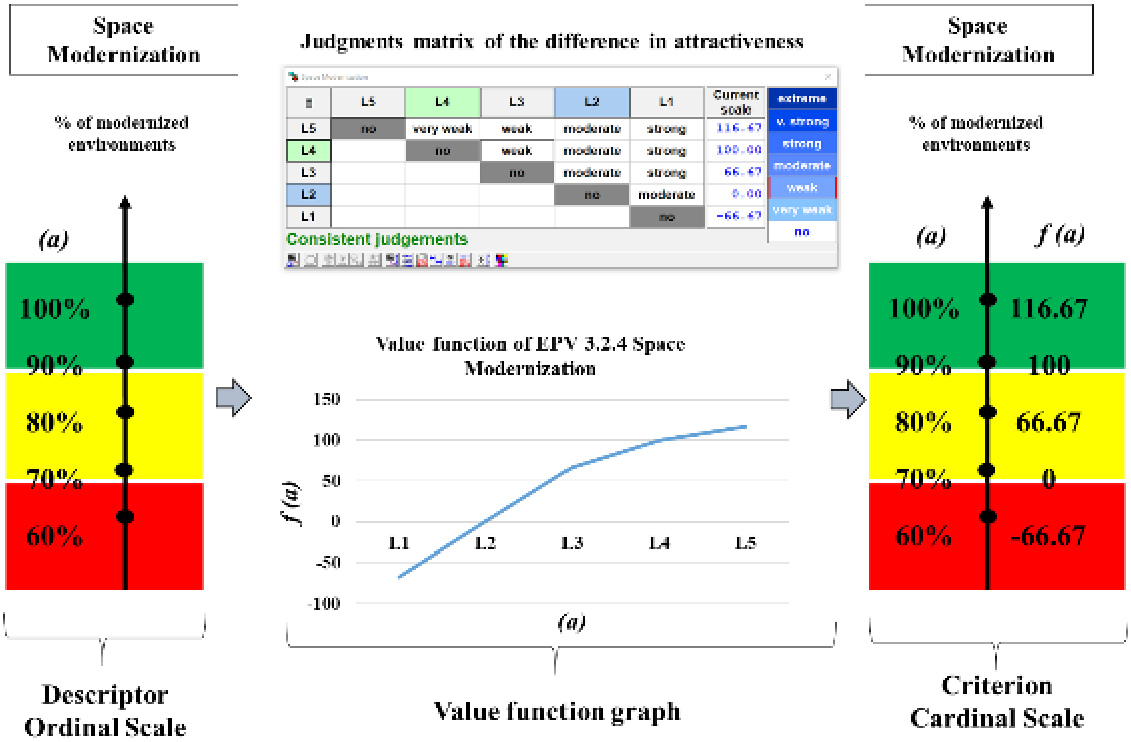
Consistent judgements

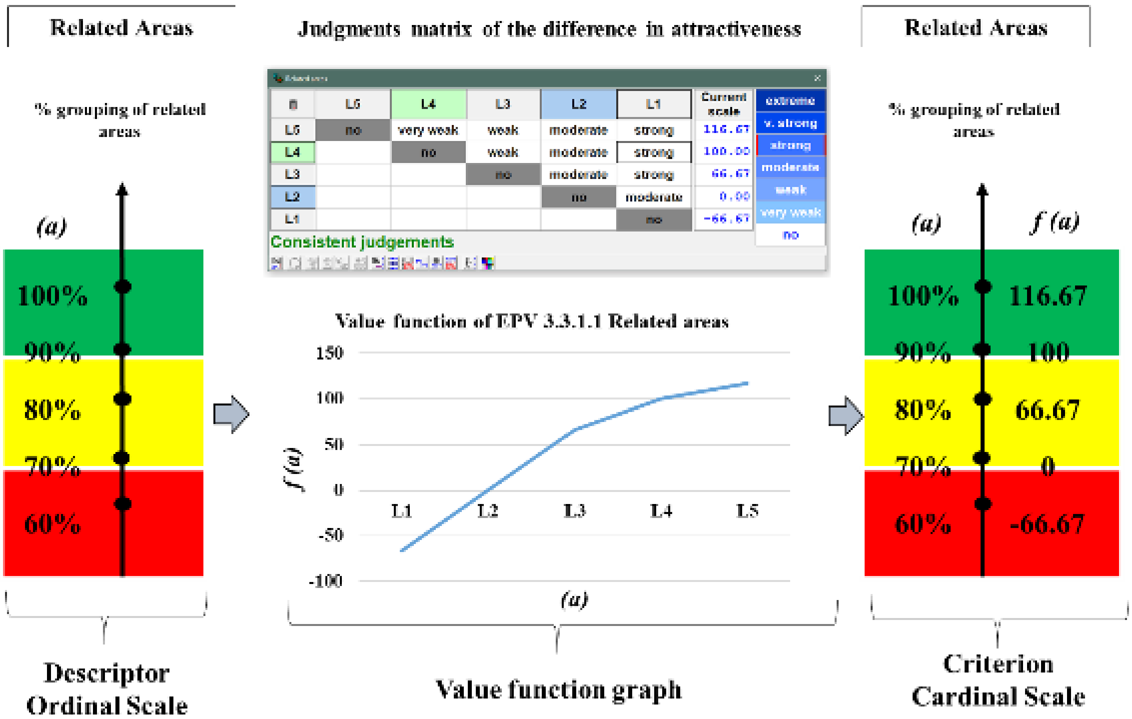


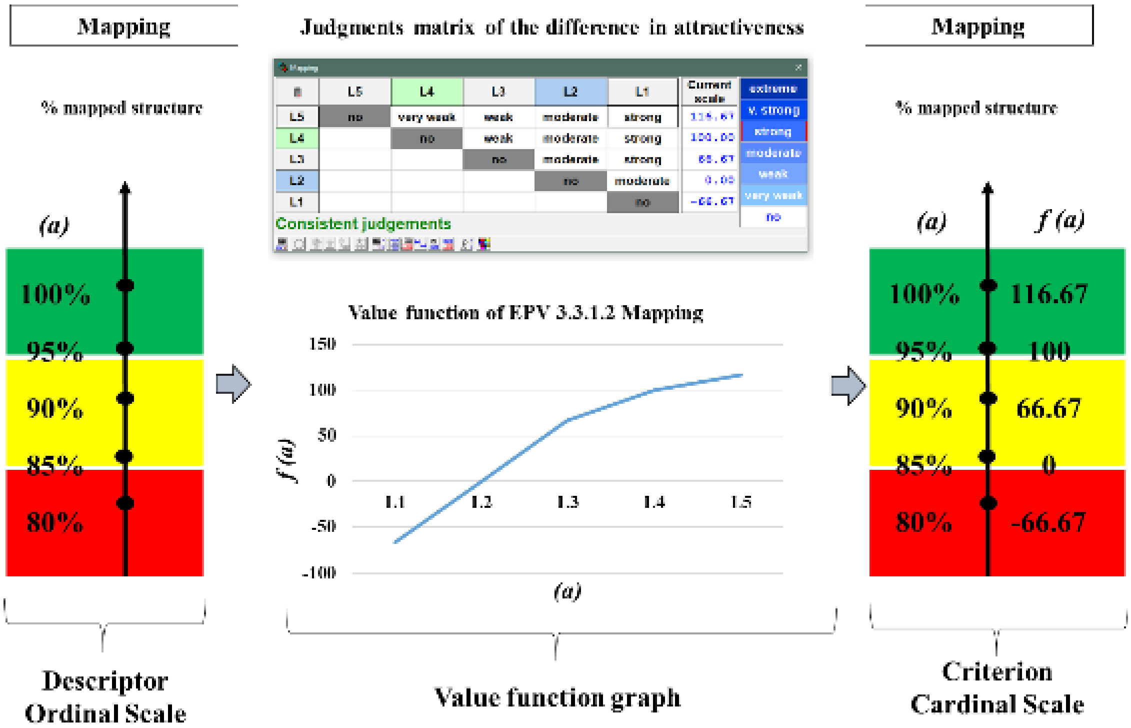
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	142.86
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	57.14
L2				no	v. strong	0.00
L1					no	-114.29

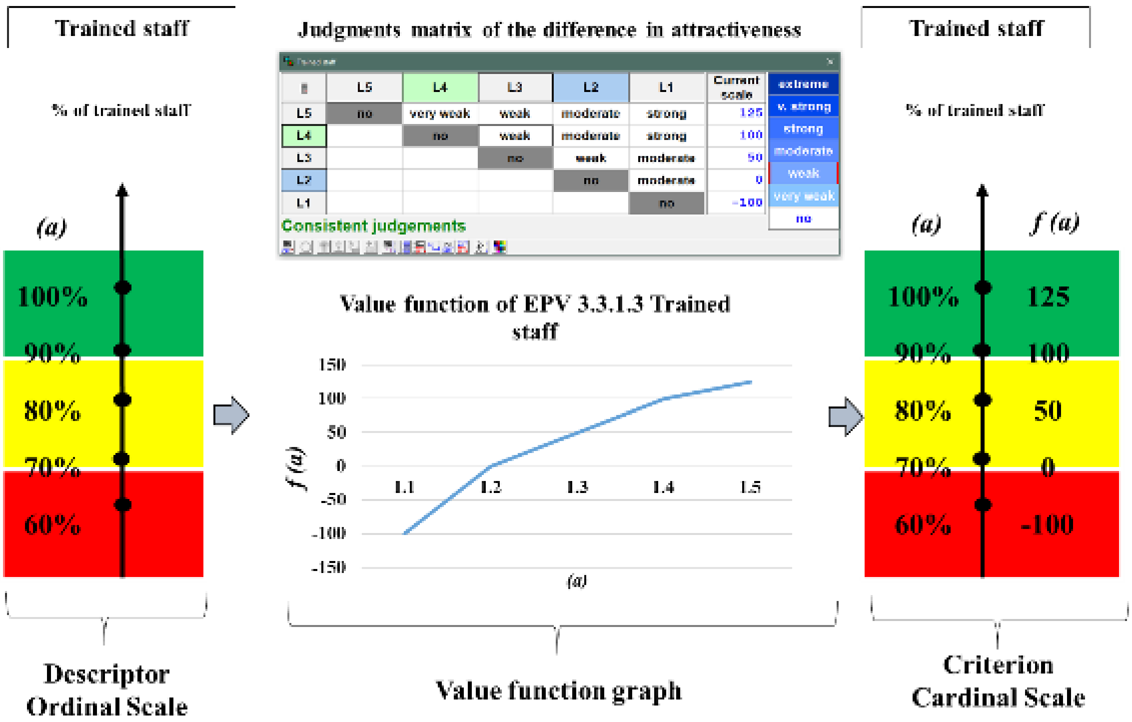


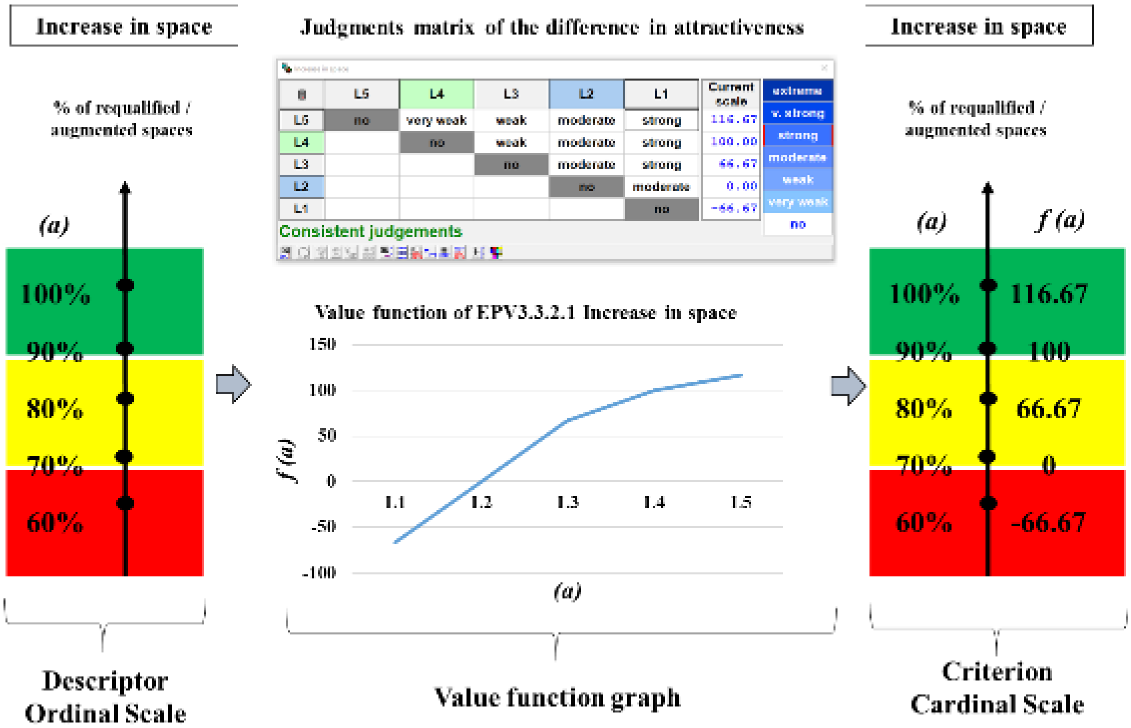
	L5	L4	L3	L2	L1	Current scale
L5	no	very weak	weak	moderate	strong	116.67
L4		no	weak	moderate	strong	100.00
L3			no	moderate	strong	66.67
L2				no	moderate	0.00
L1					no	-66.67

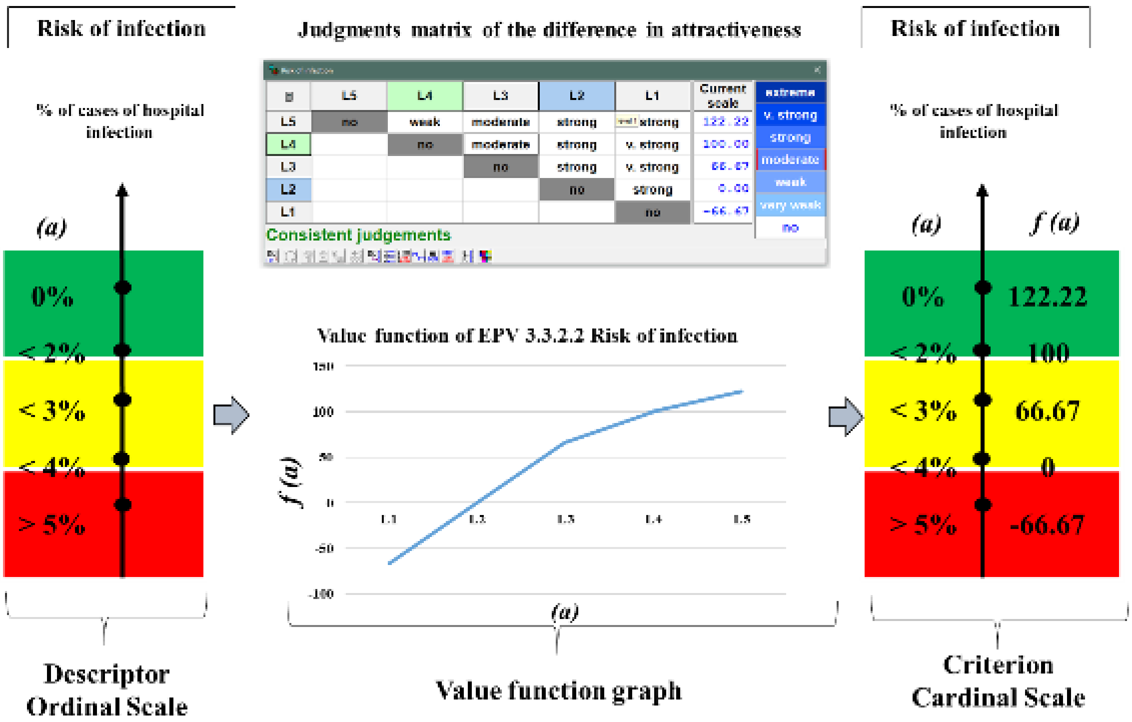

Space Modernization
Judgments matrix of the difference in attractiveness
Space Modernization
% of modernized environments
% of modernized environments
Consistent judgements
Value function of EPV 3.2.4 Space Modernization
(a)
f (a)
100%
90%
80%
70%
60%
116.67
100
66.67
0
-66.67
L1
L2
L3
L4
L5
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

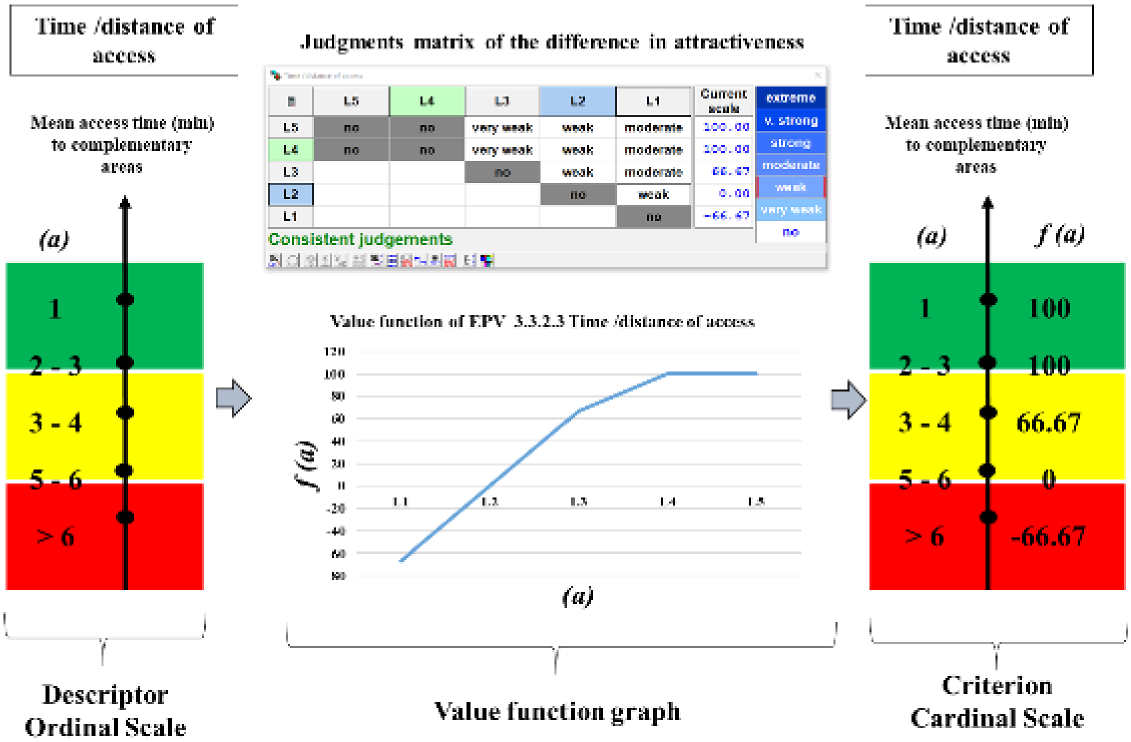

Related Areas
Judgments matrix of the difference in attractiveness
Related Areas
% grouping of related areas
% grouping of related areas
Consistent judgements
Value function of EPV 3.3.1.1 Related areas
(a)
f (a)
100%
90%
80%
70%
60%
116.67
100
66.67
0
-66.67
L1
L2
L3
L4
L5
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

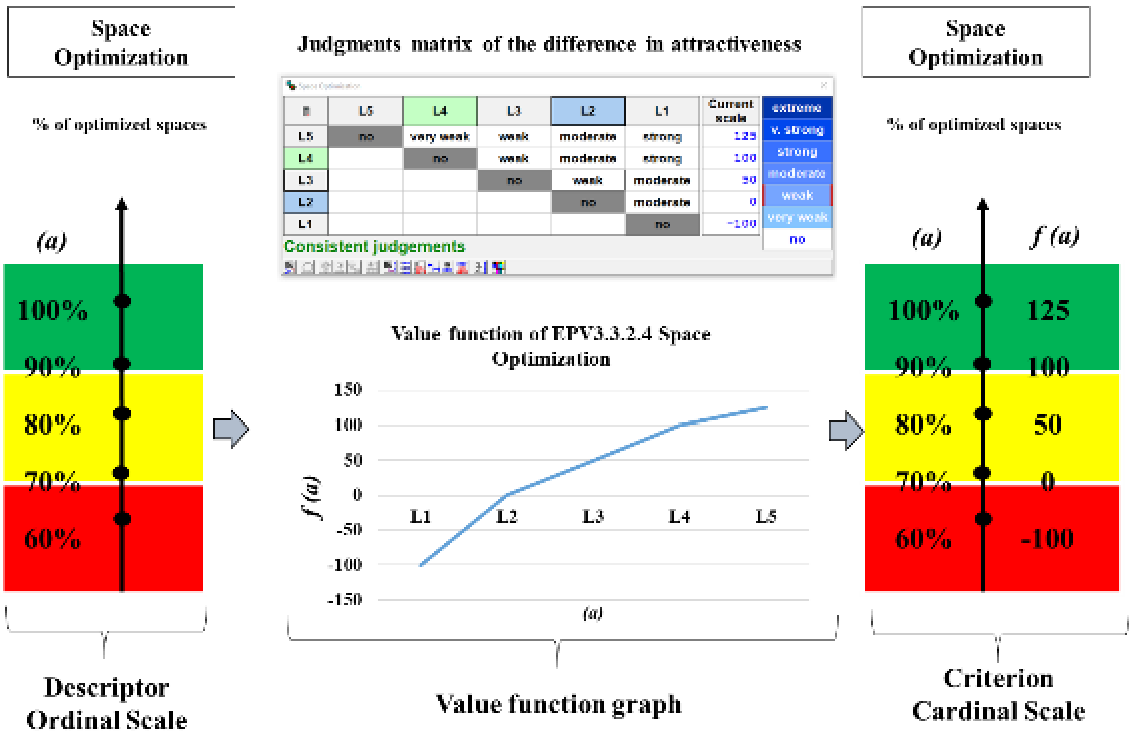

Mapping
% mapped structure
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
Consistent judgements
Value function of EPV 3.3.1.2 Mapping
f (a)
(a)
Value function graph
Mapping
% mapped structure
(a) f (a)
100% 116.67
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale

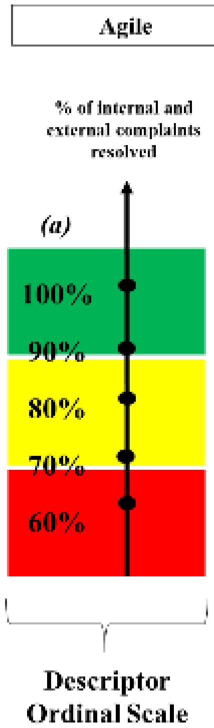

Trained staff
% of trained staff
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
Consistent judgements
Value function of EPV 3.3.1.3 Trained staff
f (a)
(a)
Value function graph
Trained staff
% of trained staff
(a) f (a)
100% 125
90% 100
80% 50
70% 0
60% -100
Criterion Cardinal Scale


Increase in space
Judgments matrix of the difference in attractiveness
Increase in space
% of requalified / augmented spaces
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no moderate 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
100%
90%
80%
70%
60%
Value function of EPV3.3.2.1 Increase in space
150
100
50
0
-50
-100
1.1
1.2
1.3
1.4
1.5
f (a)
(a)
f (a)
116.67
100
66.67
0
-66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Risk of infection
Judgments matrix of the difference in attractiveness
Risk of infection
% of cases of hospital infection
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
0%
< 2%
< 3%
< 4%
> 5%
Value function of EPV 3.3.2.2 Risk of infection
150
100
50
0
-50
-100
1.1
1.2
1.3
1.4
1.5
f (a)
(a)
f (a)
122.22
100
66.67
0
-66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Time /distance of access
Mean access time (min) to complementary areas
(a)
1
2 - 3
3 - 4
5 - 6
> 6
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no no very weak weak moderate 100.00
L4 no no very weak weak moderate 100.00
L3 no weak moderate 66.67
L2 no weak 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 3.3.2.3 Time /distance of access
f (a)
(a)
L1 L2 L3 L4 L5
Value function graph
Time /distance of access
Mean access time (min) to complementary areas
(a) f (a)
1 100
2 - 3 100
3 - 4 66.67
5 - 6 0
> 6 -66.67
Criterion Cardinal Scale


Space Optimization
% of optimized spaces
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 125
L4 no weak moderate strong 100
L3 no weak moderate 50
L2 no moderate 0
L1 no -100
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV3.3.2.4 Space Optimization
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Space Optimization
% of optimized spaces
(a) f (a)
100% 125
90% 100
80% 50
70% 0
60% -100
Criterion Cardinal Scale

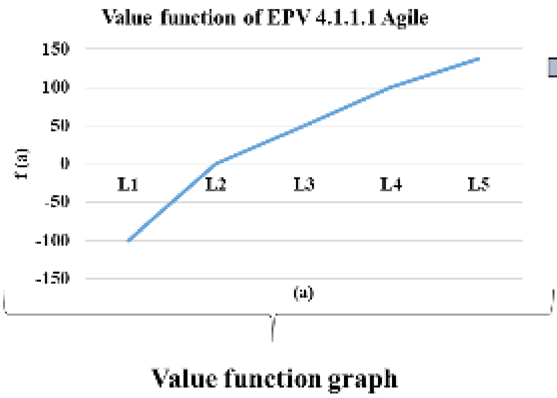


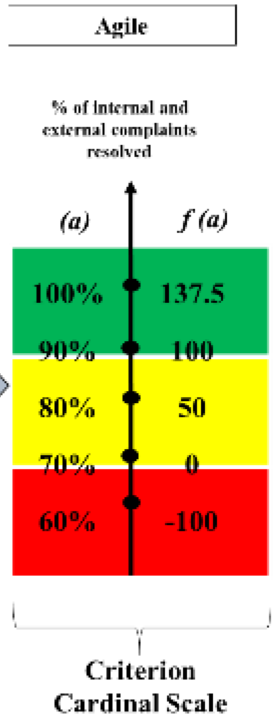
Judgments matrix of the difference in attractiveness

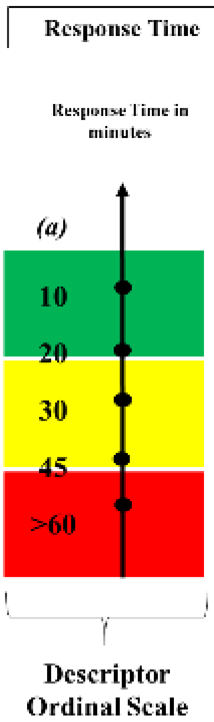
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	137.5
L4		no	strong	v. strong	extreme	100.0
L3			no	strong	v. strong	50.0
L2				no	v. strong	0.0
L1					no	-100.0

extreme
v. strong
strong
moderate
weak
very weak
no

Consistent judgements





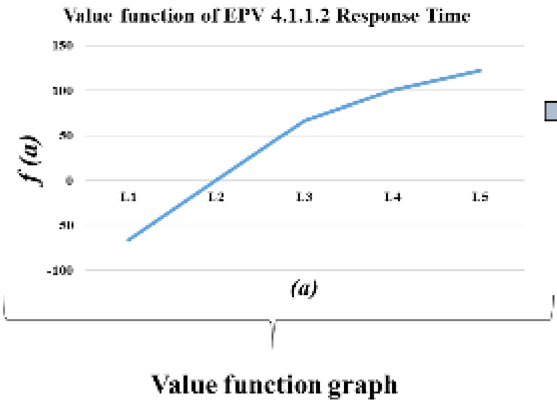


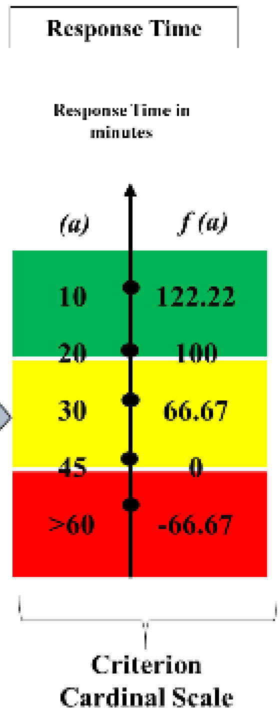
Judgments matrix of the difference in attractiveness

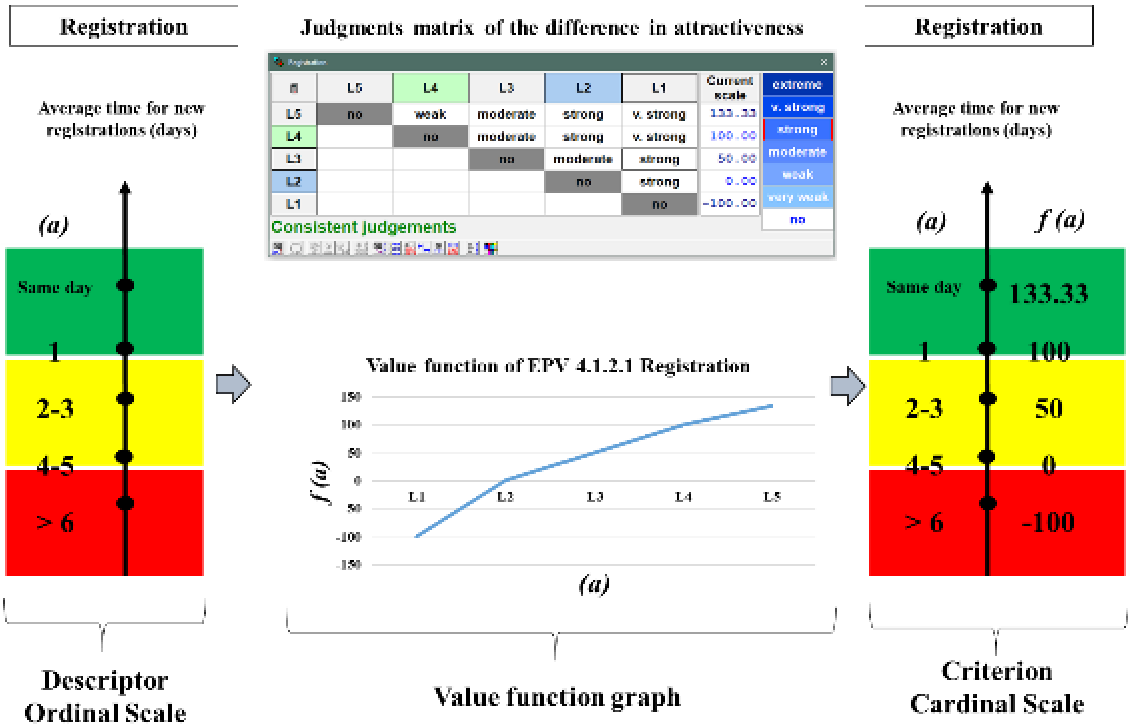
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	strong	0.00
L1					no	-66.67

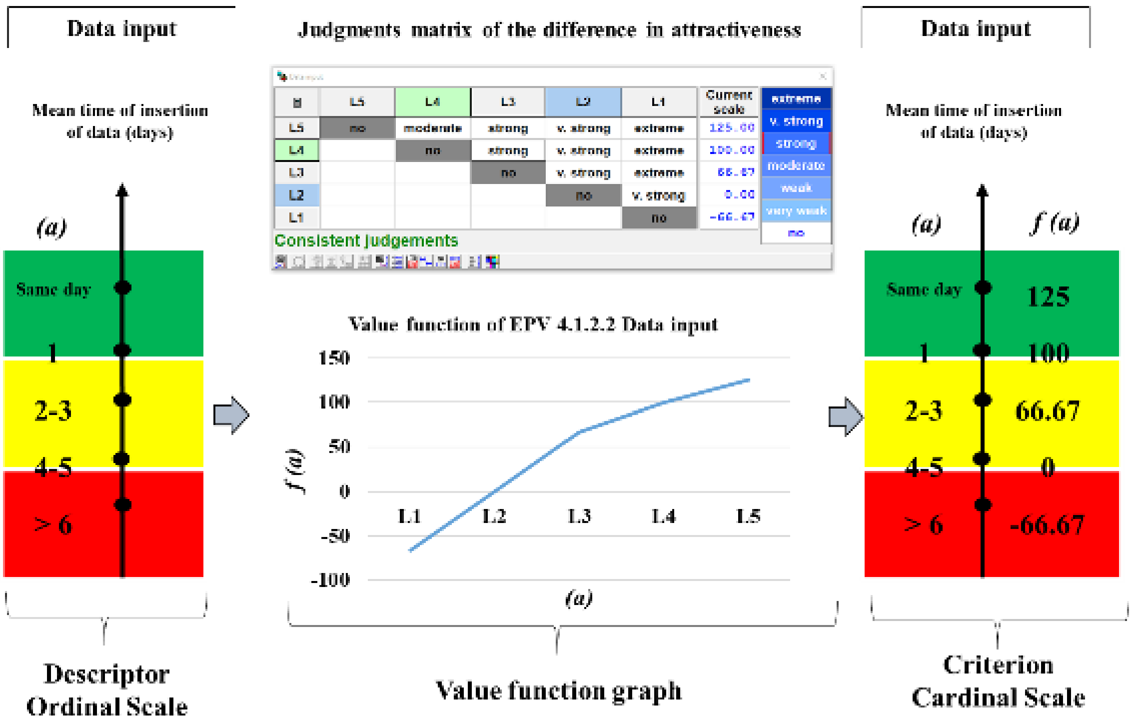
extreme
v. strong
strong
moderate
weak
very weak
no

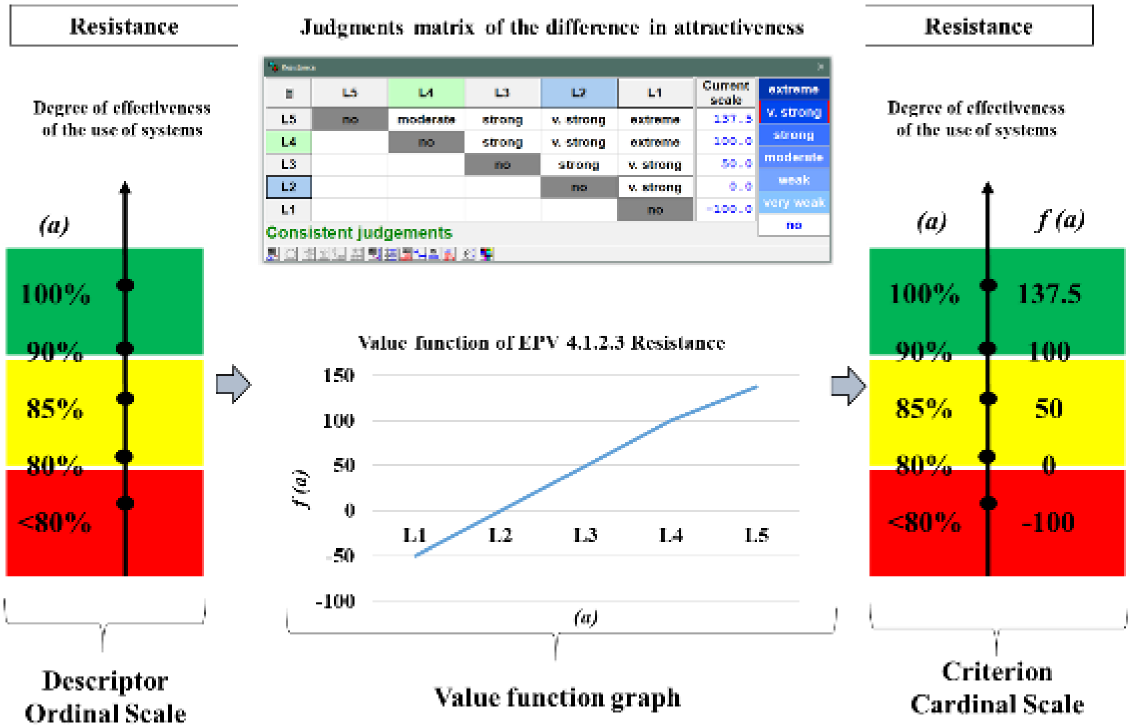
Consistent judgements

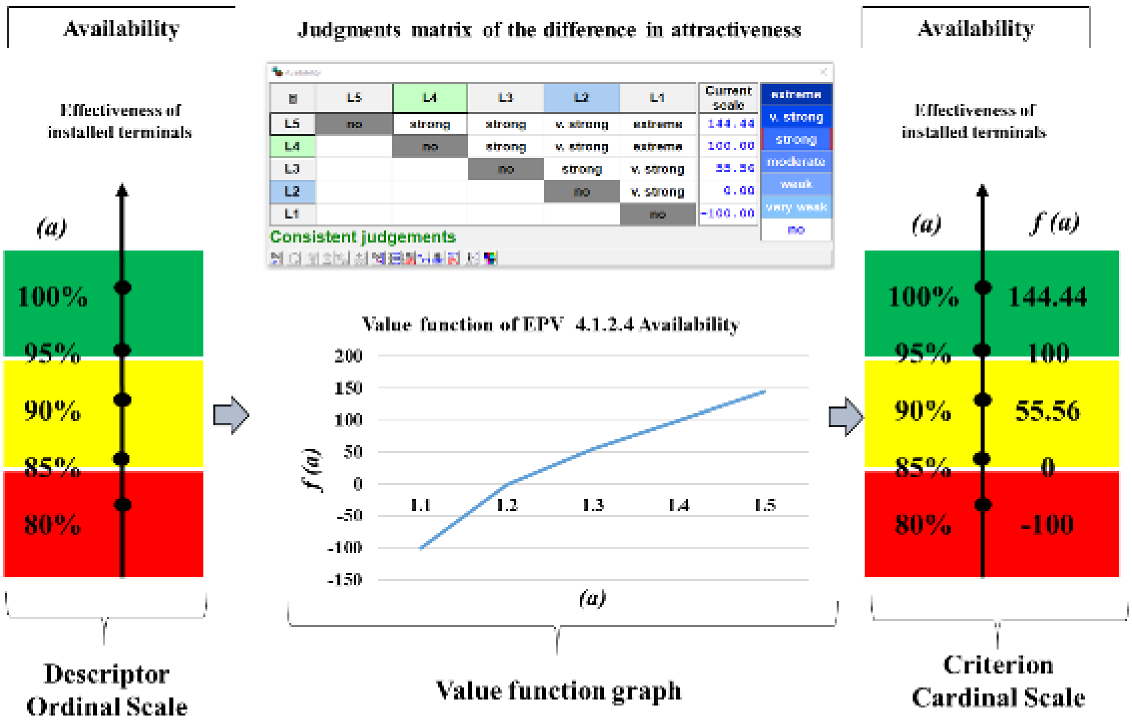


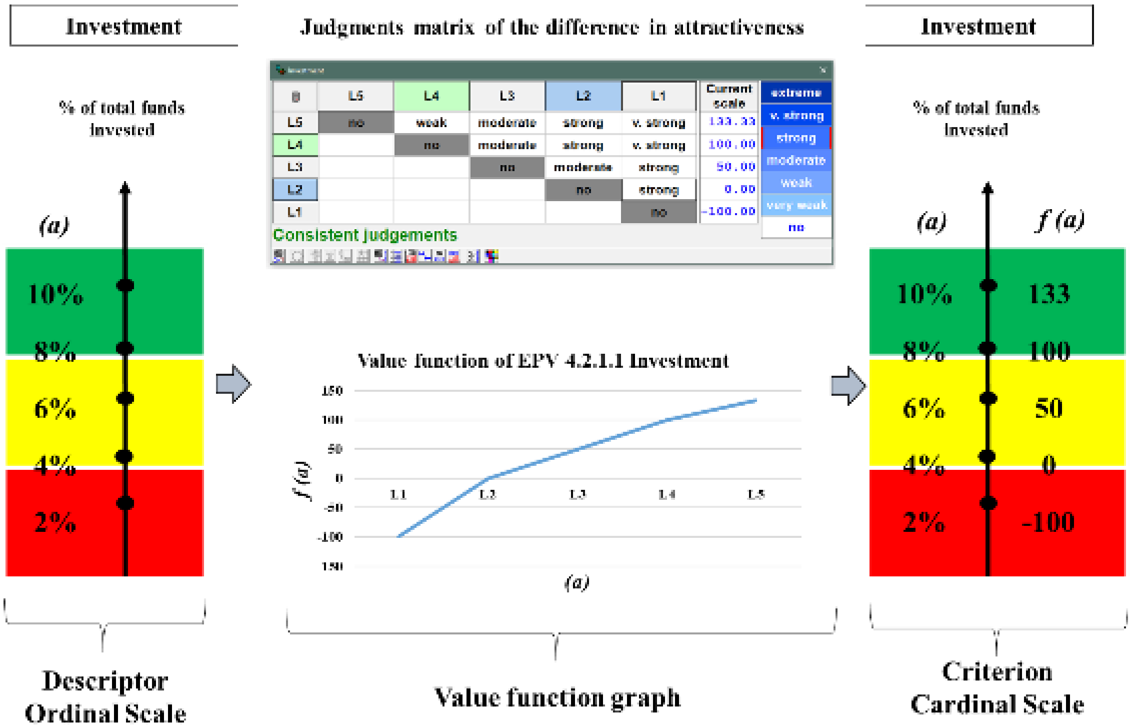


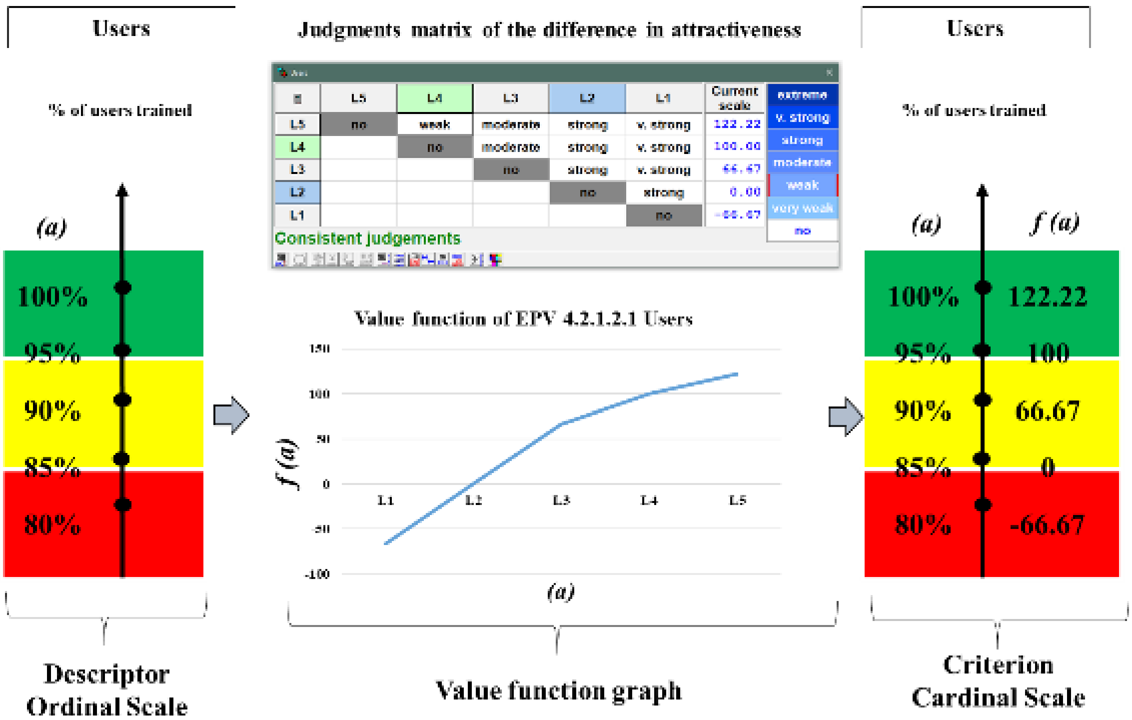

Registration
Judgments matrix of the difference in attractiveness
Registration
Average time for new registrations (days)
(a)
Same day
1
2-3
4-5
> 6
L5 L4 L3 L2 L1
Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.1.2.1 Registration
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
(a)
Average time for new registrations (days)
(a) f (a)
Same day 133.33
1 100
2-3 50
4-5 0
> 6 -100
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

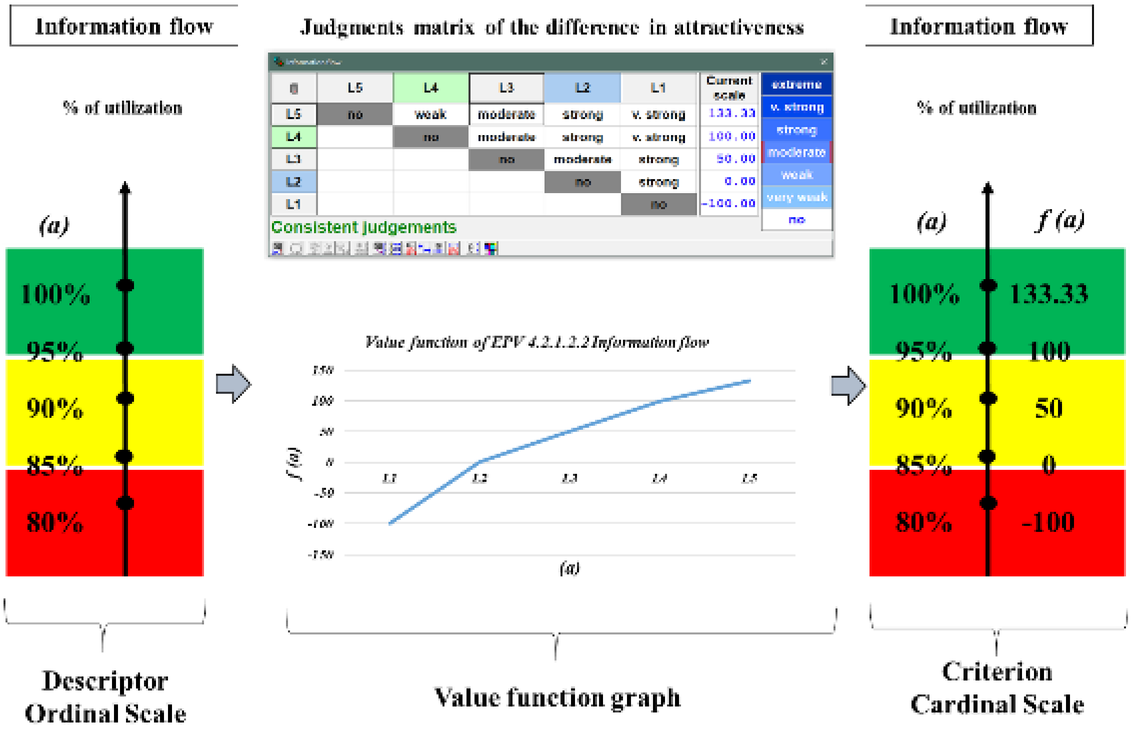

Data input
Judgments matrix of the difference in attractiveness
Data input
Mean time of insertion of data (days)
(a)
Same day
1
2-3
4-5
> 6
L5 L4 L3 L2 L1
Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no v. strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.1.2.2 Data input
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Mean time of insertion of data (days)
(a) f (a)
Same day 125
1 100
2-3 66.67
4-5 0
> 6 -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

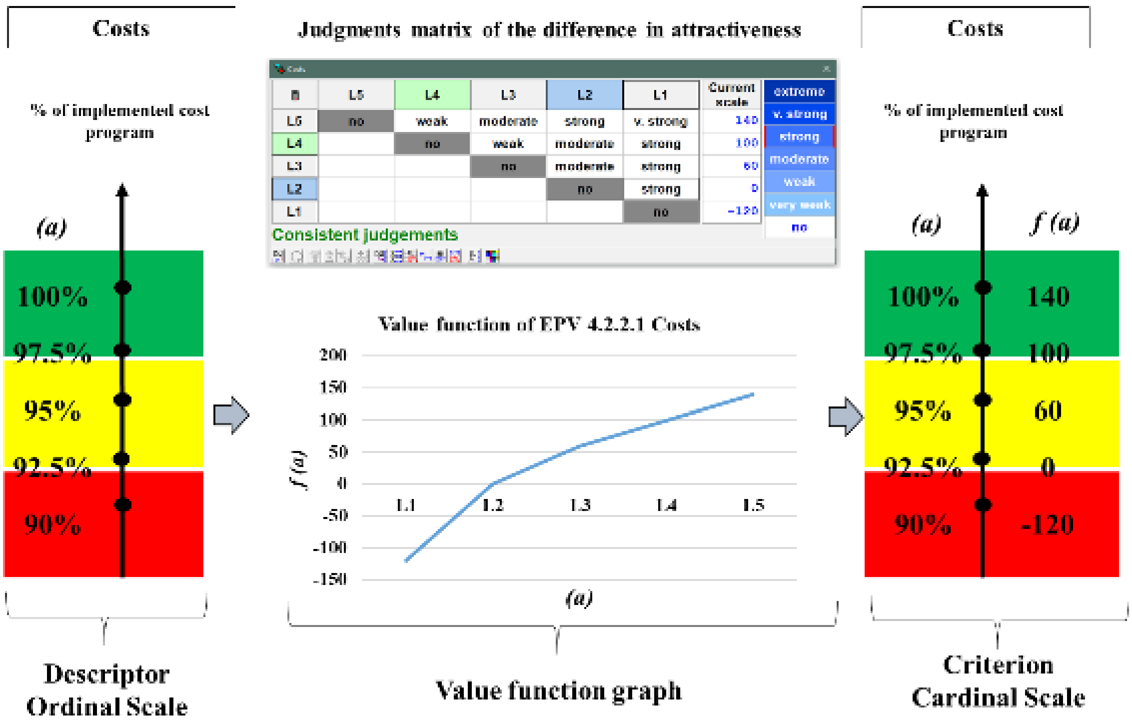

Resistance
Degree of effectiveness of the use of systems
(a)
100%
90%
85%
80%
<80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 137.5
L4 no strong v. strong extreme 100.0
L3 no strong v. strong 50.0
L2 no v. strong 0.0
L1 no -100.0
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 4.1.2.3 Resistance
150 100 50 0 -50 -100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Resistance
Degree of effectiveness of the use of systems
(a) f (a)
100% 137.5
90% 100
85% 50
80% 0
<80% -100
Criterion Cardinal Scale

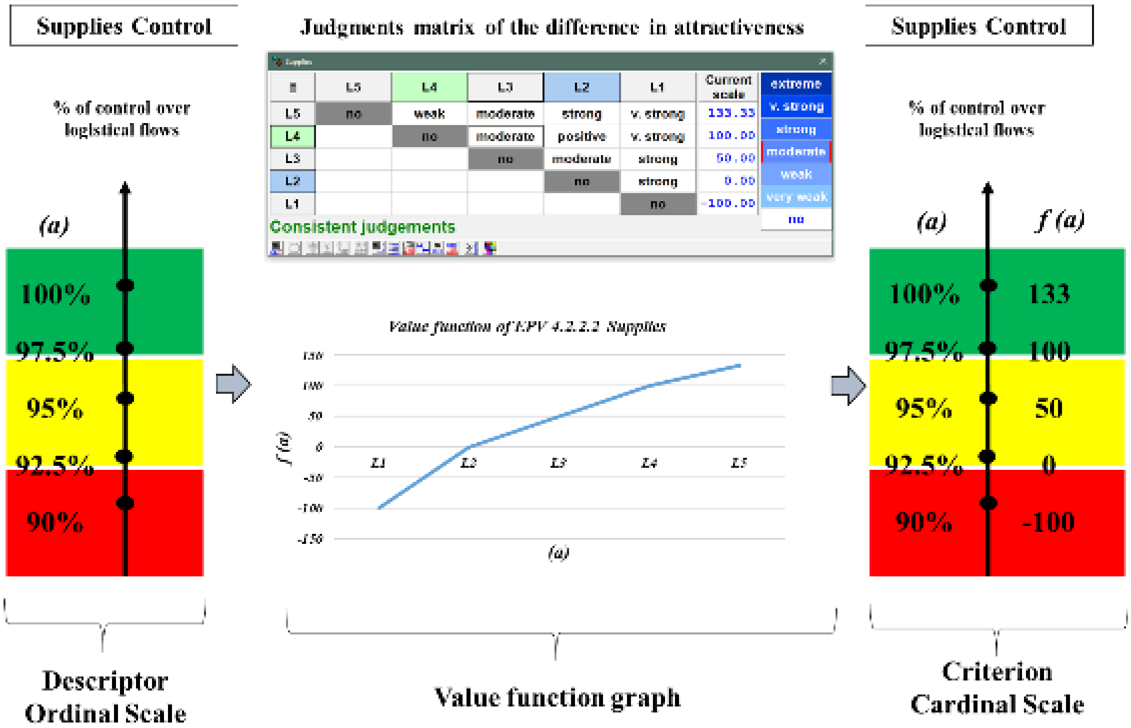

Availability
Effectiveness of installed terminals
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no strong strong v. strong extreme 144.44
L4 no strong v. strong extreme 100.00
L3 no strong v. strong 55.56
L2 no v. strong 0.00
L1 no -100.00
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 4.1.2.4 Availability
200 150 100 50 0 -50 -100 -150
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Availability
Effectiveness of installed terminals
(a) f (a)
100% 144.44
95% 100
90% 55.56
85% 0
80% -100
Criterion Cardinal Scale


Investment
% of total funds invested
(a)
10%
8%
6%
4%
2%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.1.1 Investment
150
100
50
0
-50
-100
-150
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Investment
% of total funds invested
(a) f (a)
10% 133
8% 100
6% 50
4% 0
2% -100
Criterion Cardinal Scale

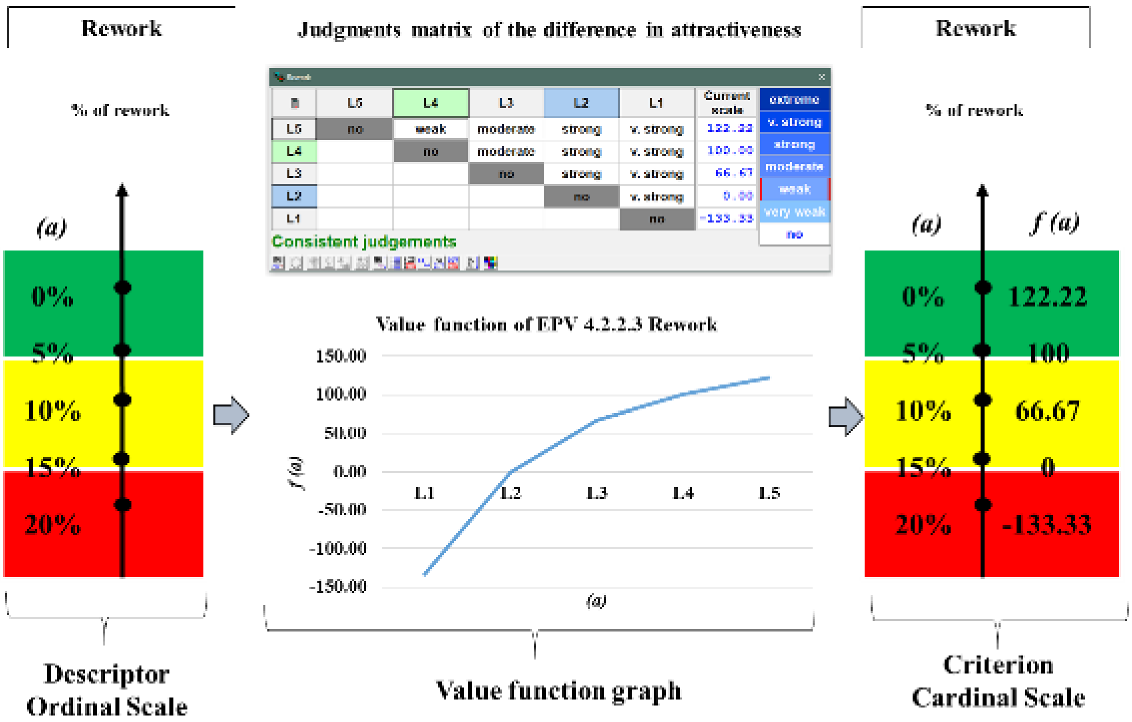

Users
% of users trained
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.1.2.1 Users
150
100
50
0
-50
-100
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Users
% of users trained
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale


Information flow
% of utilization
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate strong v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.1.2.2 Information flow
f (a)
(a)
L1 L2 L3 L4 L5
Value function graph
Information flow
% of utilization
(a) f (a)
100% 133.33
95% 100
90% 50
85% 0
80% -100
Criterion Cardinal Scale

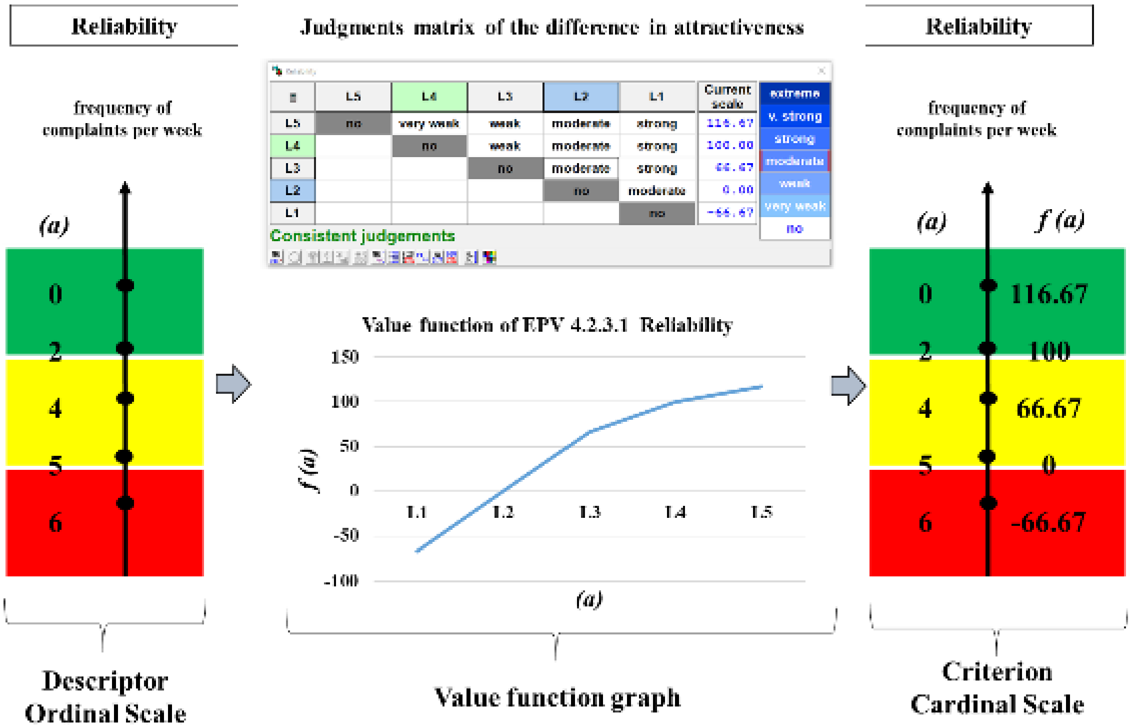

Costs
% of implemented cost program
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 140
L4 no weak moderate strong 100
L3 no moderate strong 60
L2 no strong 0
L1 no -120
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.2.1 Costs
f (a)
(a)
L1 L2 L3 L4 L5
Value function graph
Costs
% of implemented cost program
(a) f (a)
100% 140
97.5% 100
95% 60
92.5% 0
90% -120
Criterion Cardinal Scale

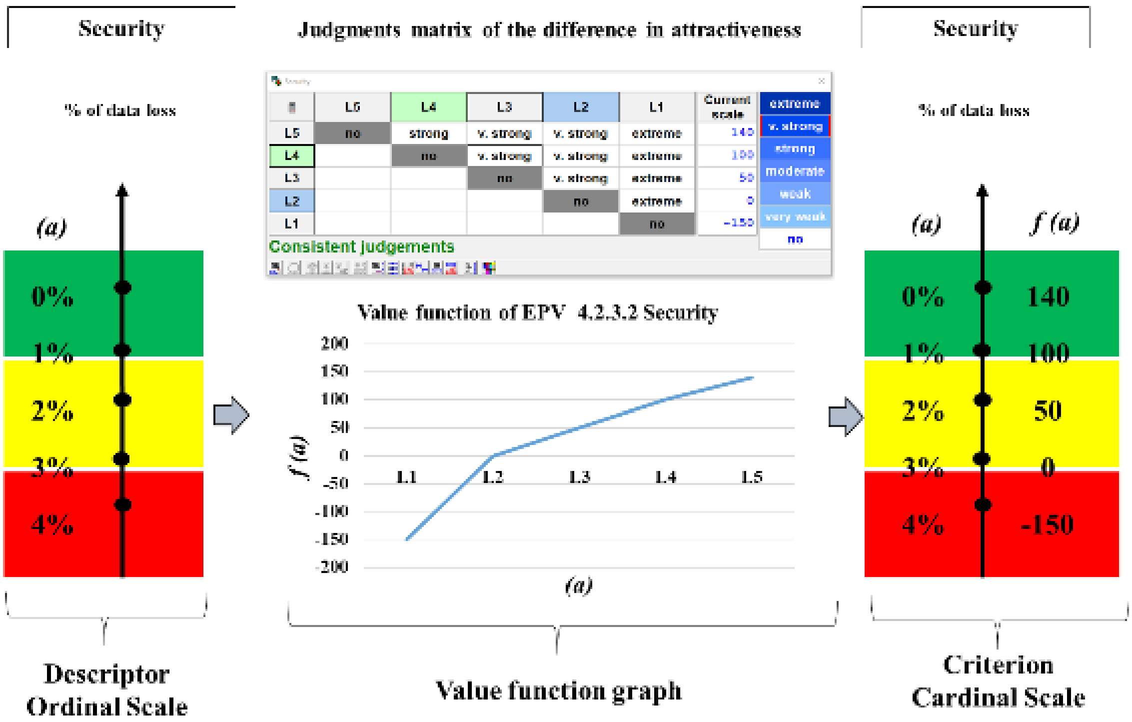


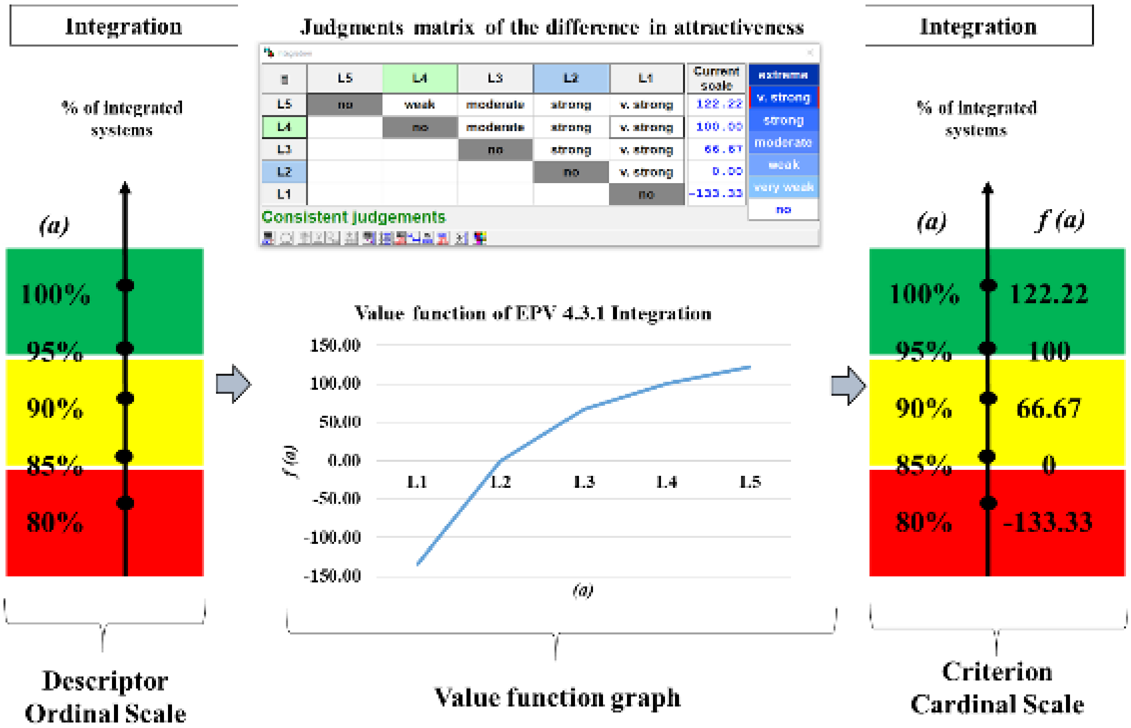
Supplies Control
Judgments matrix of the difference in attractiveness
Supplies Control
% of control over logistical flows
(a)
100%
97.5%
95%
92.5%
90%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 133.33
L4 no moderate positive v. strong 100.00
L3 no moderate strong 50.00
L2 no strong 0.00
L1 no -100.00
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.2.2 Supplies
f (a)
L1 L2 L3 L4 L5
(a)
% of control over logistical flows
(a) f (a)
100% 133
97.5% 100
95% 50
92.5% 0
90% -100
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

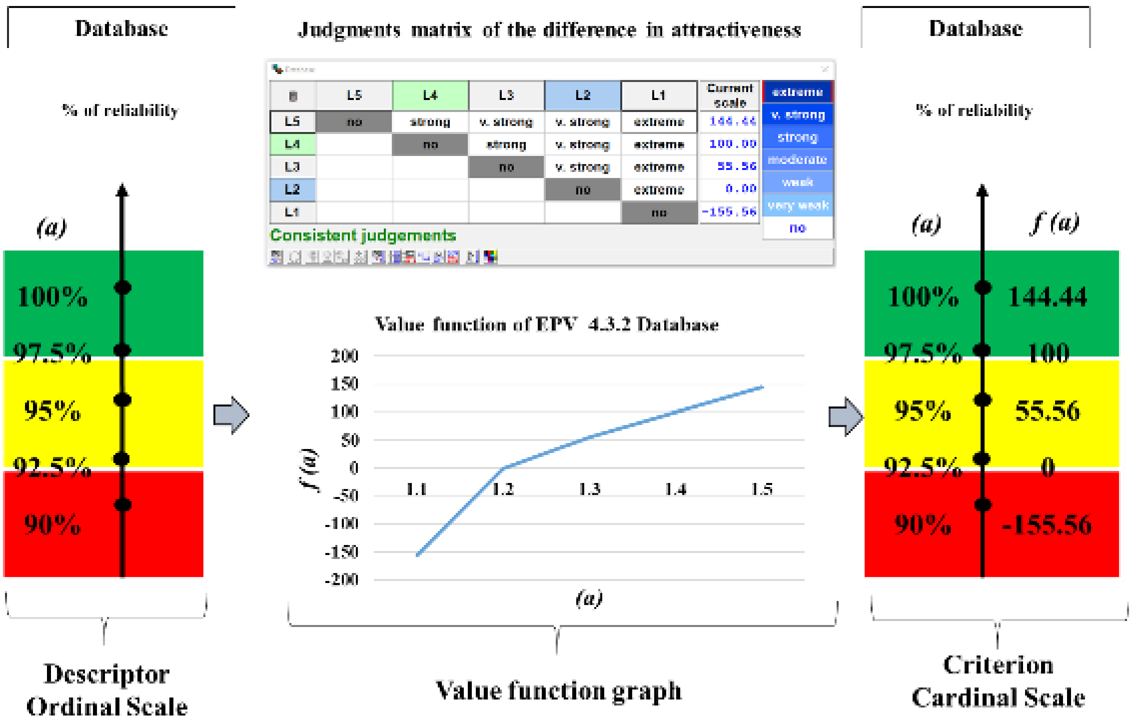


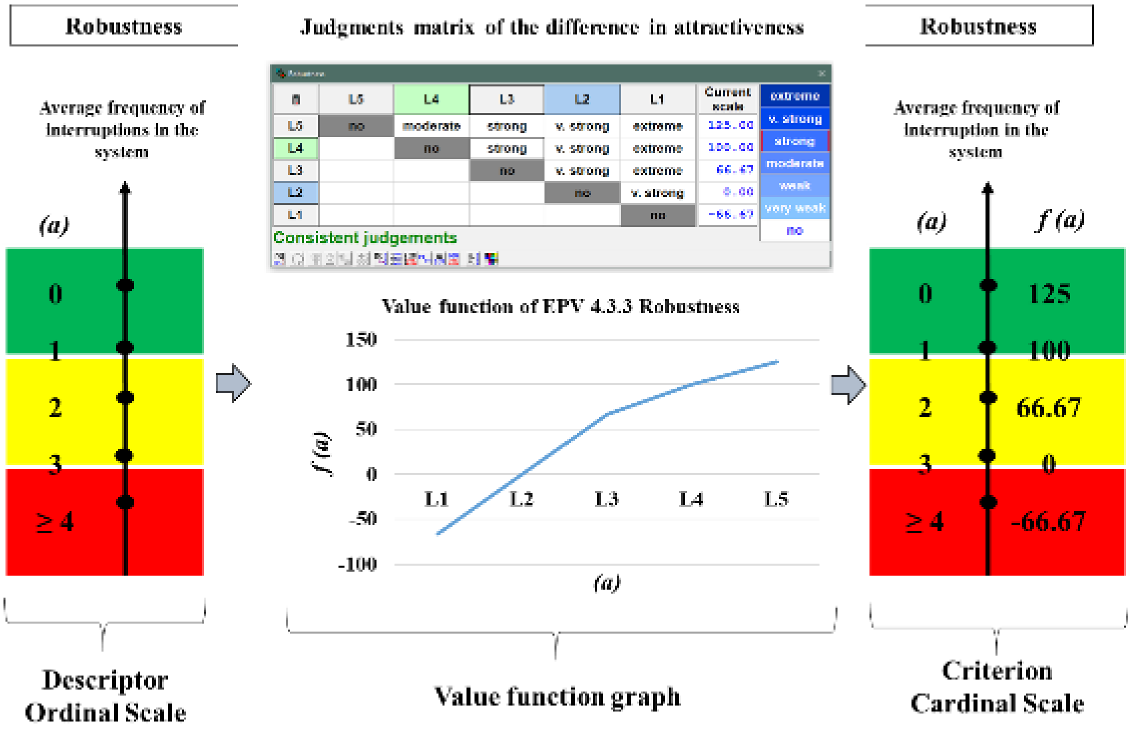
Rework
Judgments matrix of the difference in attractiveness
Rework
% of rework
(a)
0%
5%
10%
15%
20%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.2.2.3 Rework
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
% of rework
(a) f (a)
0% 122.22
5% 100
10% 66.67
15% 0
20% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

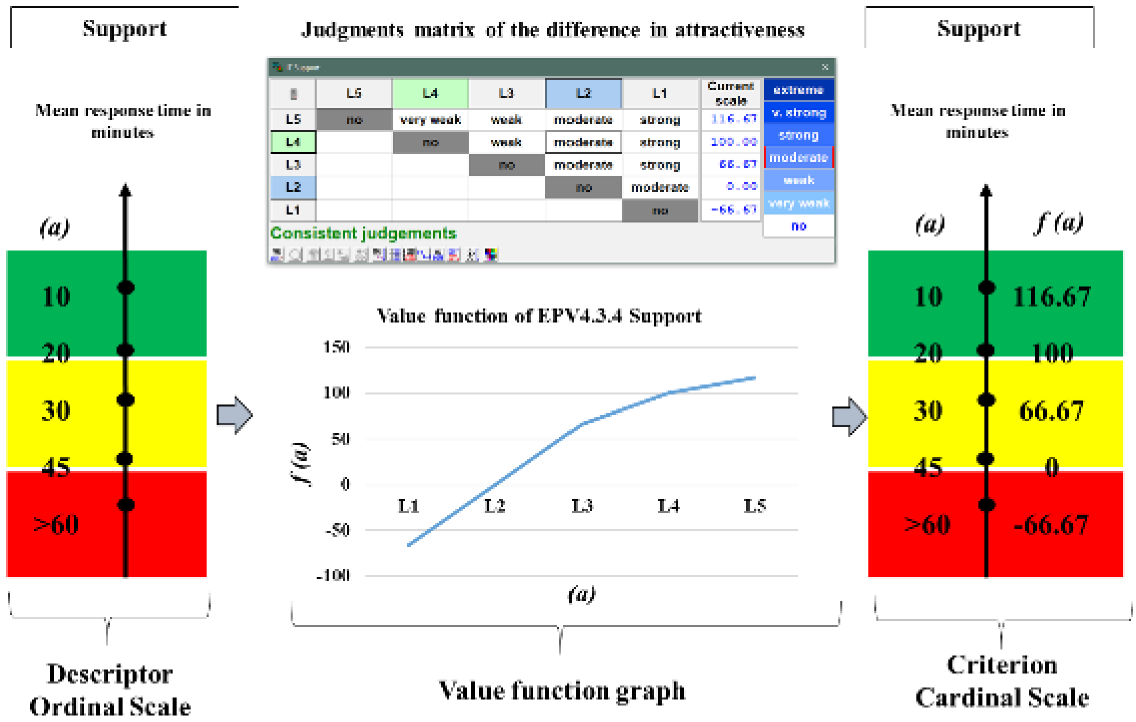

Reliability
Judgments matrix of the difference in attractiveness
Reliability
frequency of complaints per week
	L5	L4	L3	L2	L1	Current scale
L5	no	very weak	weak	moderate	strong	116.67
L4		no	weak	moderate	strong	100.00
L3			no	moderate	strong	66.67
L2				no	moderate	0.00
L1					no	-66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
frequency of complaints per week
(a)
0
2
4
5
6
Value function of EPV 4.2.3.1 Reliability
150
100
50
0
-50
-100
L1
L2
L3
L4
L5
f (a)
(a)
(a)
f (a)
0 116.67
2 100
4 66.67
5 0
6 -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

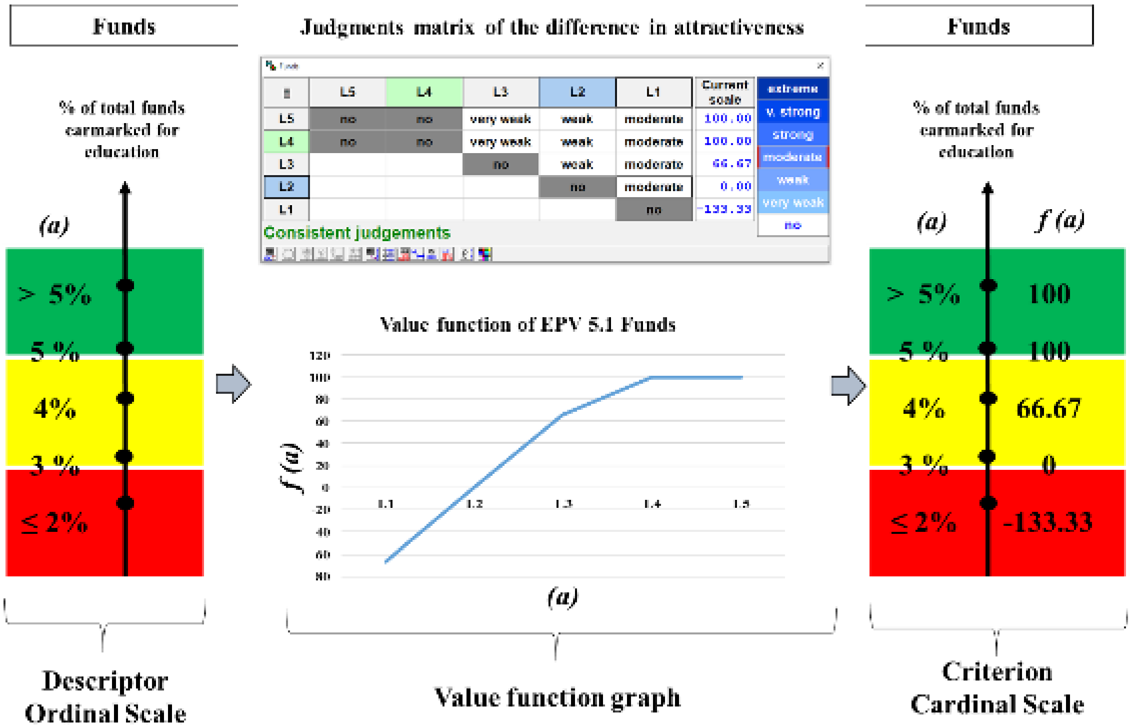

Security
Judgments matrix of the difference in attractiveness
Security
% of data loss
	L5	L4	L3	L2	L1	Current scale
L5	no	strong	v. strong	v. strong	extreme	140
L4		no	v. strong	v. strong	extreme	100
L3			no	v. strong	extreme	50
L2				no	extreme	0
L1					no	-150
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
% of data loss
(a)
0%
1%
2%
3%
4%
Value function of EPV 4.2.3.2 Security
200
150
100
50
0
-50
-100
-150
-200
L1
L2
L3
L4
L5
f (a)
(a)
(a)
f (a)
0% 140
1% 100
2% 50
3% 0
4% -150
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Integration
Judgments matrix of the difference in attractiveness
% of integrated systems
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.3.1 Integration
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
1.1 1.2 1.3 1.4 1.5
f (a)
(a)
f (a)
122.22
100
66.67
0
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Database
Judgments matrix of the difference in attractiveness
% of reliability
(a)
100%
97.5%
95%
92.5%
90%
L5 L4 L3 L2 L1 Current scale
L5 no strong v. strong v. strong extreme 144.44
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 55.56
L2 no extreme 0.00
L1 no -155.56
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.3.2 Database
200
150
100
50
0
-50
-100
-150
-200
1.1 1.2 1.3 1.4 1.5
f (a)
(a)
f (a)
144.44
100
55.56
0
-155.56
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

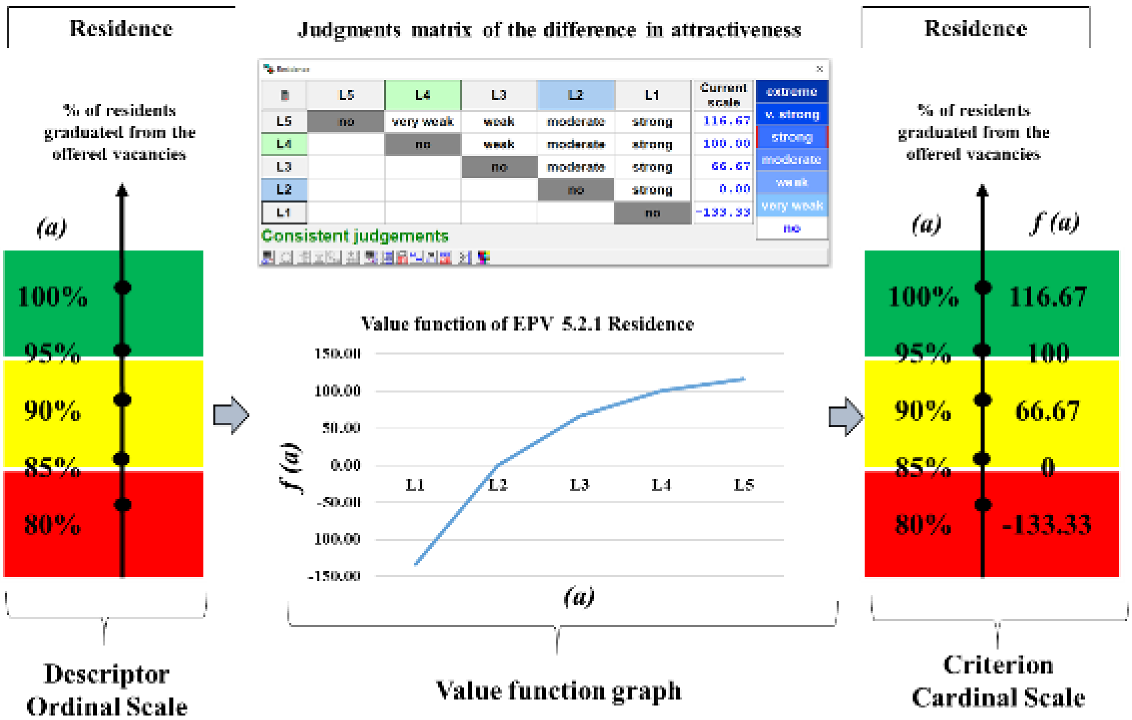

Robustness
Average frequency of interruptions in the system
(a)
0
1
2
3
≥ 4
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no v. strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 4.3.3 Robustness
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Robustness
Average frequency of interruption in the system
(a) f (a)
0 125
1 100
2 66.67
3 0
≥ 4 -66.67
Criterion Cardinal Scale


Support
Mean response time in minutes
(a)
10
20
30
45
>60
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no moderate 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV4.3.4 Support
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Support
Mean response time in minutes
(a) f (a)
10 116.67
20 100
30 66.67
45 0
>60 -66.67
Criterion Cardinal Scale



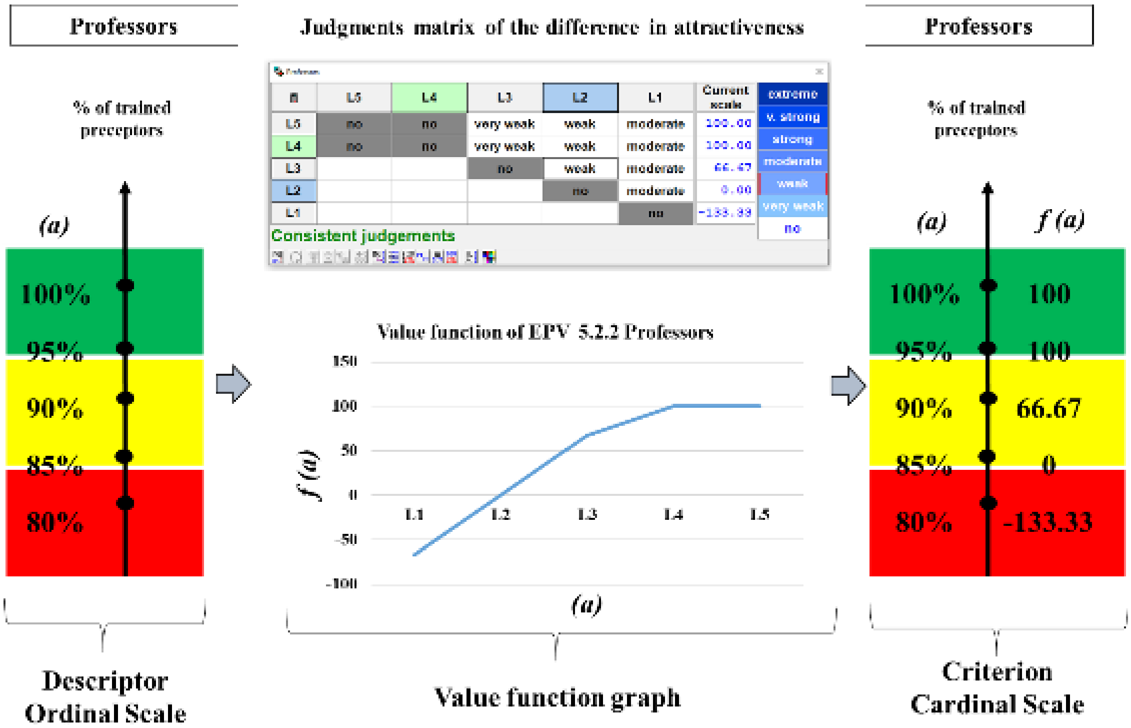
	L5	L4	L3	L2	L1	Current scale
L5	no	no	very weak	weak	moderate	100.00
L4	no	no	very weak	weak	moderate	100.00
L3			no	weak	moderate	66.67
L2				no	moderate	0.00
L1					no	-133.33

extreme, v. strong, strong, moderate, weak, very weak, no



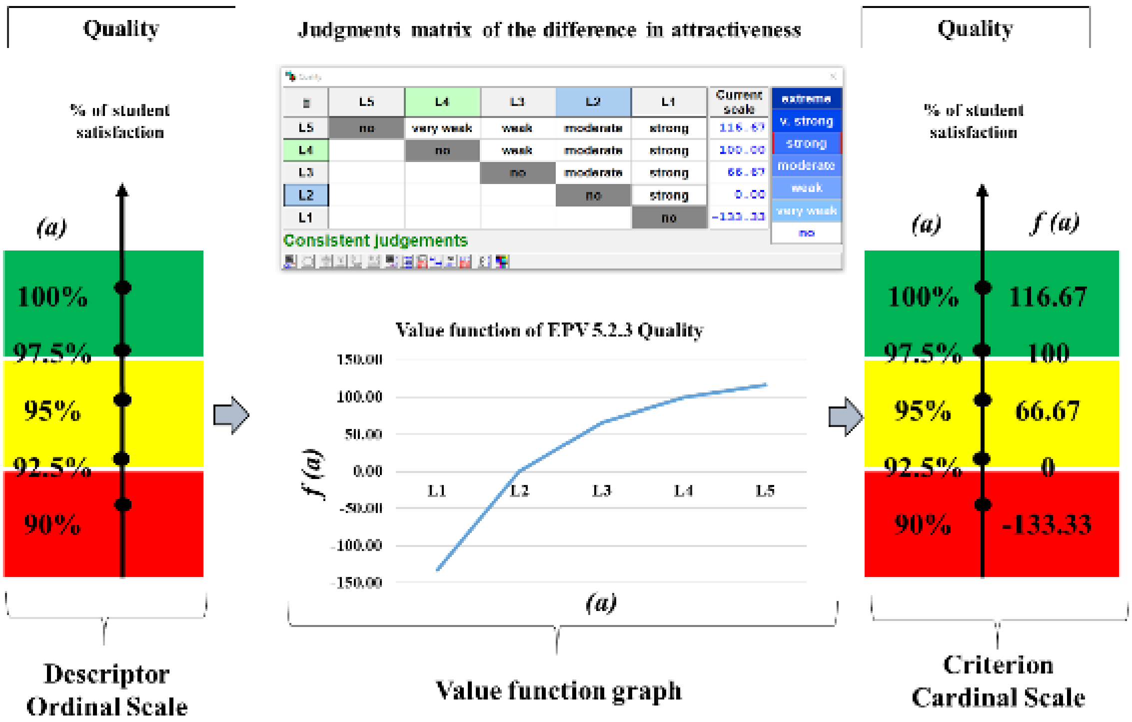
	L5	L4	L3	L2	L1	Current scale
L5	no	very weak	weak	moderate	strong	116.67
L4		no	weak	moderate	strong	100.00
L3			no	moderate	strong	66.67
L2				no	strong	0.00
L1					no	-133.33

extreme, v. strong, strong, moderate, weak, very weak, no



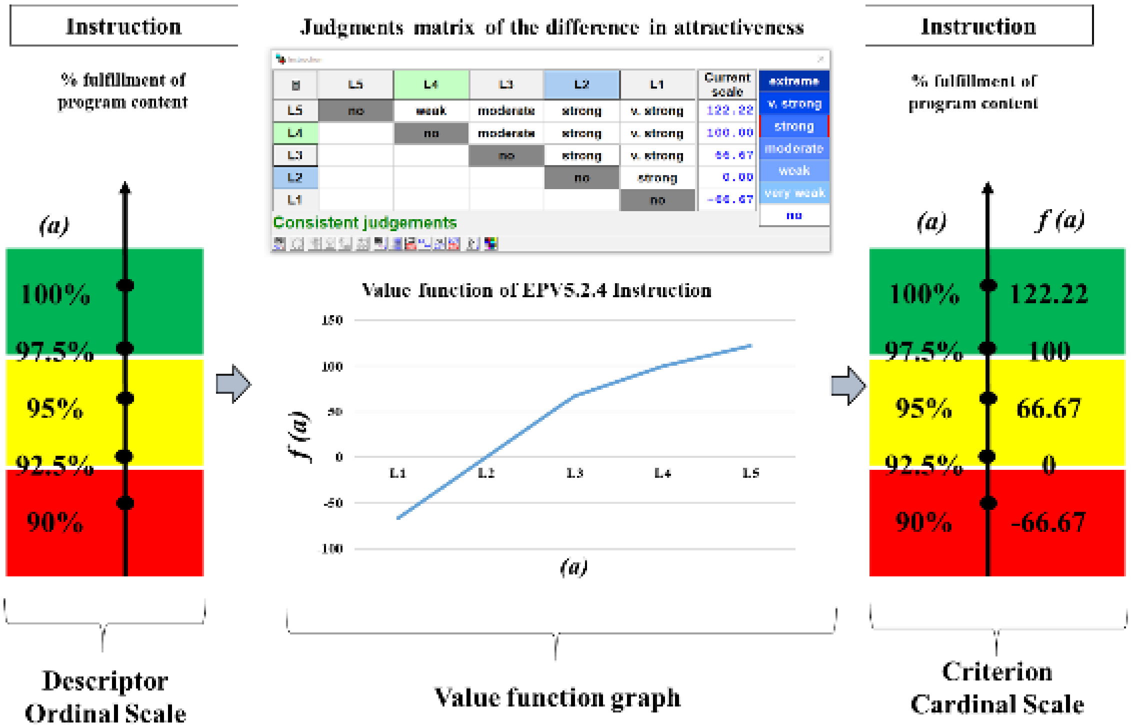
#	L5	L4	L3	L2	L1	Current scale
L5	no	no	very weak	weak	moderate	100.00
L4	no	no	very weak	weak	moderate	100.00
L3			no	weak	moderate	66.67
L2				no	moderate	0.00
L1					no	-133.33

extreme, v. strong, strong, moderate, weak, very weak, no

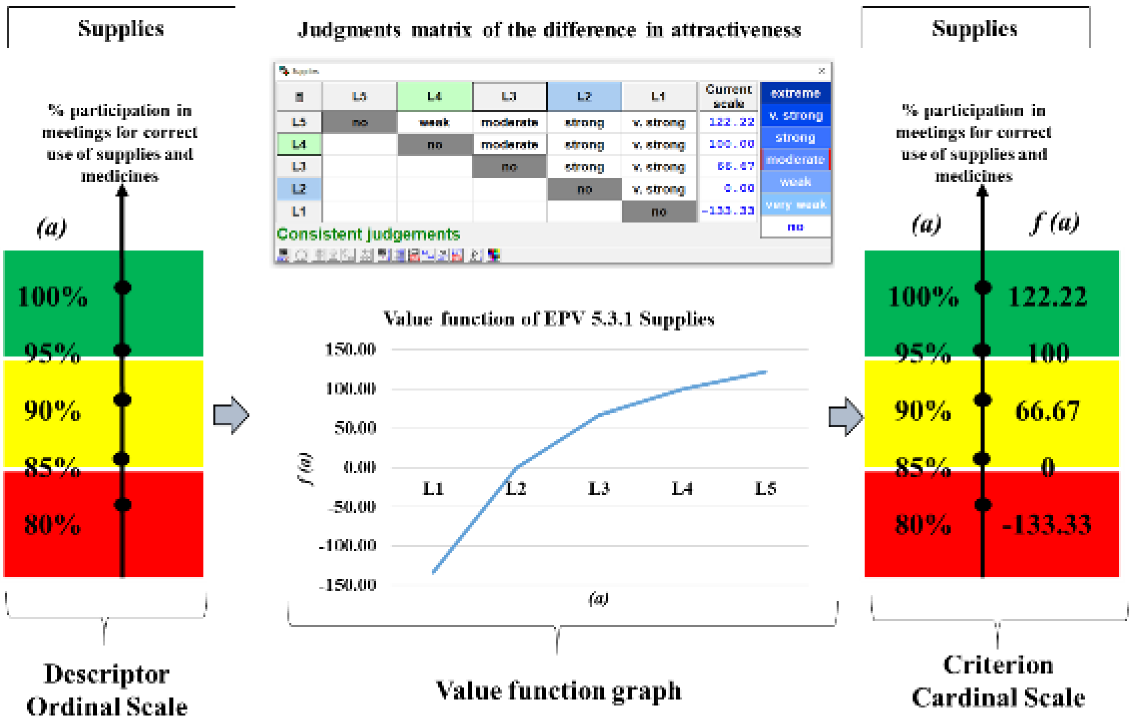


#	L5	L4	L3	L2	L1	Current scale
L5	no	very weak	weak	moderate	strong	116.67
L4		no	weak	moderate	strong	100.00
L3			no	moderate	strong	66.67
L2				no	strong	0.00
L1					no	-133.33

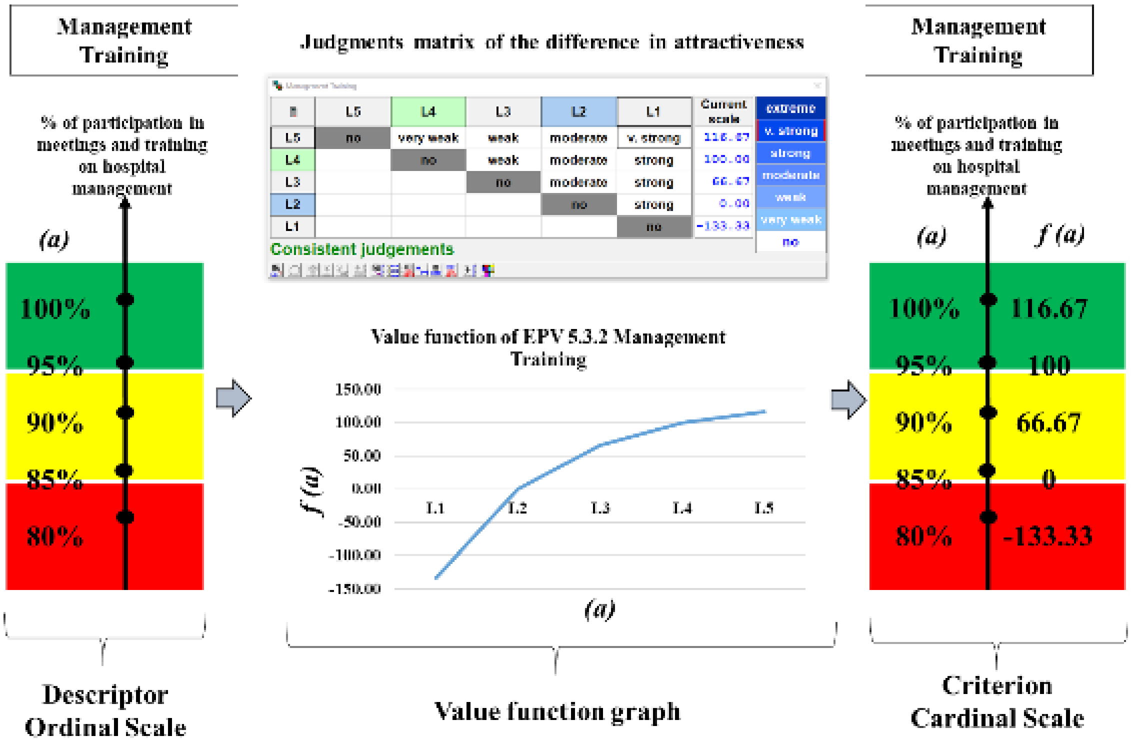
extreme, v. strong, strong, moderate, weak, very weak, no

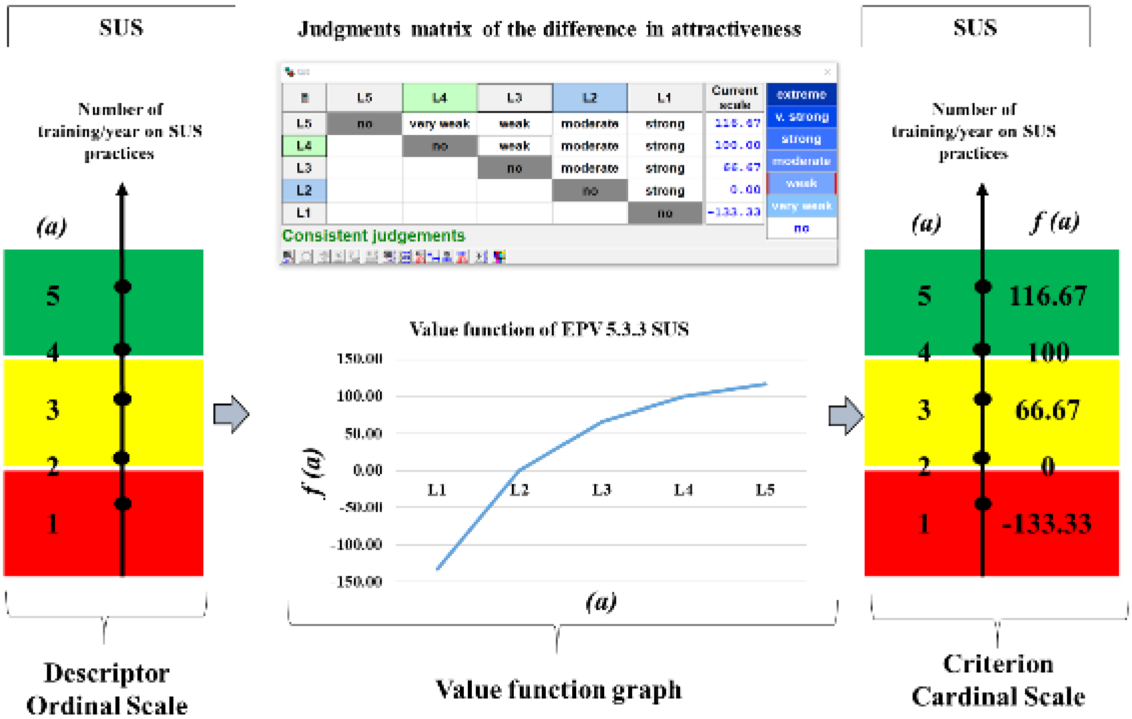


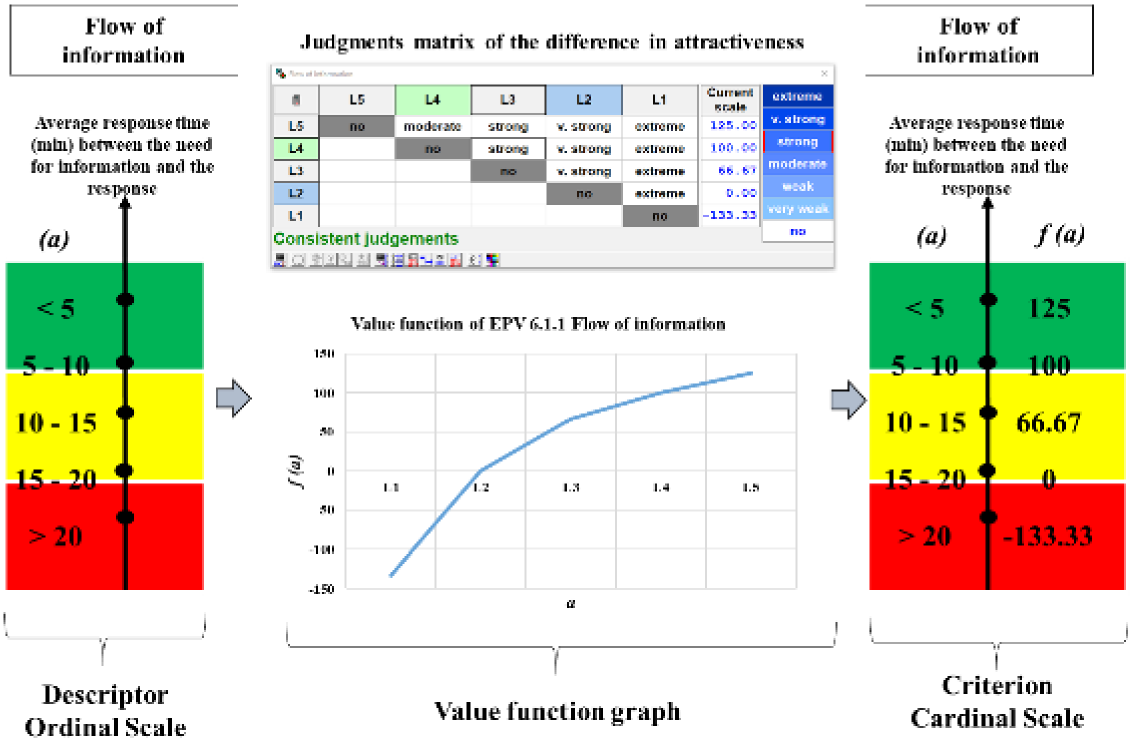
Instruction
% fulfillment of program content
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV5.2.4 Instruction
150
100
50
0
-50
-100
L1 L2 L3 L4 L5
f (a)
(a)
(a)
100%
97.5%
95%
92.5%
90%
(a) f (a)
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

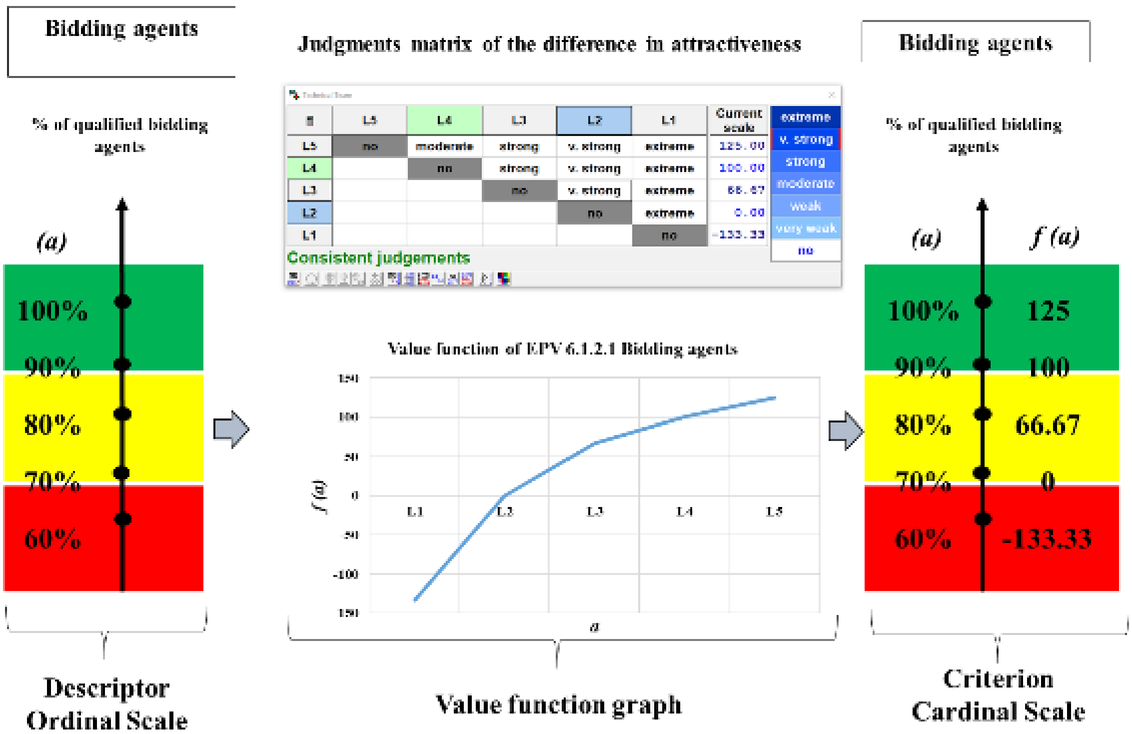


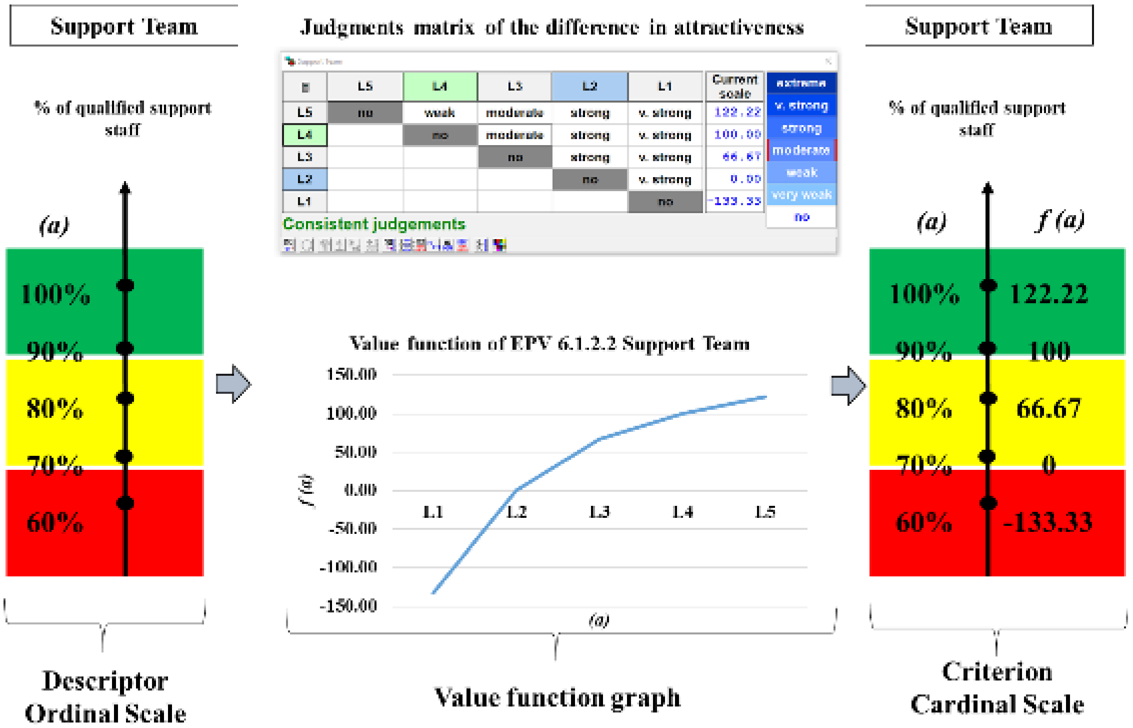
Supplies
% participation in meetings for correct use of supplies and medicines
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 5.3.1 Supplies
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
L1 L2 L3 L4 L5
f (a)
(a)
(a)
100%
95%
90%
85%
80%
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

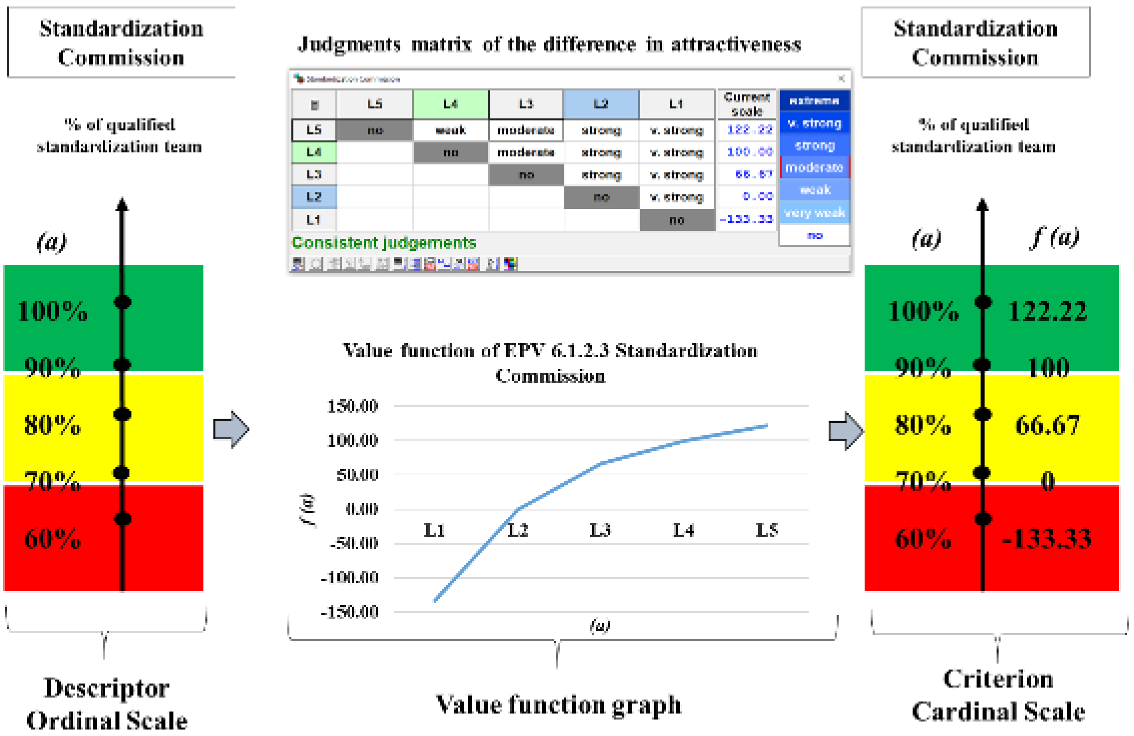

Management Training
% of participation in meetings and training on hospital management
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate v. strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no strong 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 5.3.2 Management Training
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Management Training
% of participation in meetings and training on hospital management
(a) f (a)
100% 116.67
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale

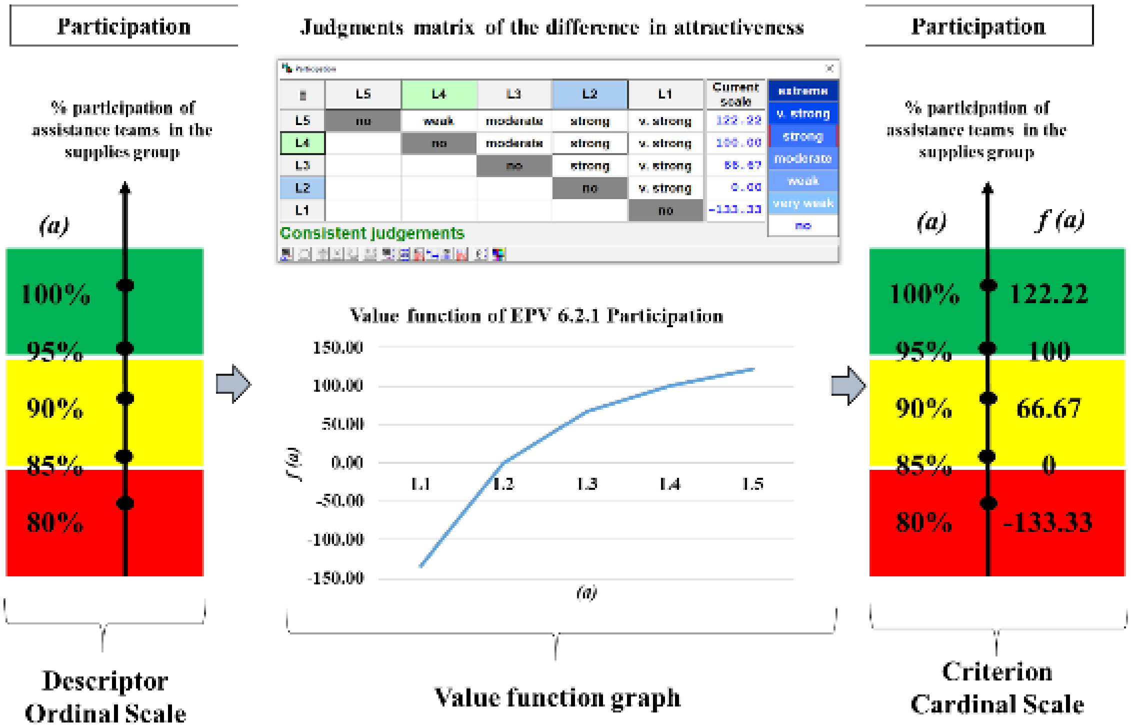

SUS
Number of training/year on SUS practices
(a)
5
4
3
2
1
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no very weak weak moderate strong 116.67
L4 no weak moderate strong 100.00
L3 no moderate strong 66.67
L2 no strong 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 5.3.3 SUS
150.00
100.00
50.00
0.00
-50.00
-100.00
150.00
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
SUS
Number of training/year on SUS practices
(a) f (a)
5 116.67
4 100
3 66.67
2 0
1 -133.33
Criterion Cardinal Scale

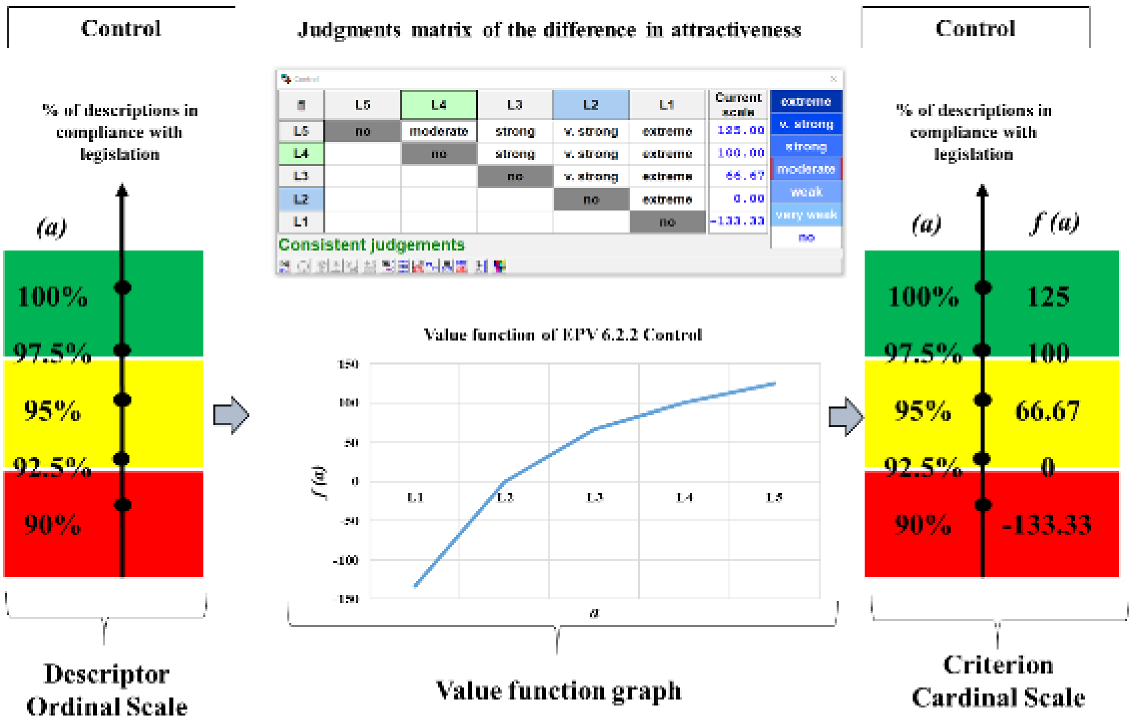

Flow of information
Average response time (min) between the need for information and the response
(a)
< 5
5 - 10
10 - 15
15 - 20
> 20
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5: no, moderate, strong, v. strong, extreme, 125.00
L4: no, strong, v. strong, extreme, 100.00
L3: no, v. strong, extreme, 66.67
L2: no, extreme, 0.00
L1: no, -133.33
extreme, v. strong, strong, moderate, weak, very weak, no
Consistent judgements
Value function of EPV 6.1.1 Flow of information
f (a)
a
L1 L2 L3 L4 L5
Flow of information
Average response time (min) between the need for information and the response
(a) f (a)
< 5 125
5 - 10 100
10 - 15 66.67
15 - 20 0
> 20 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

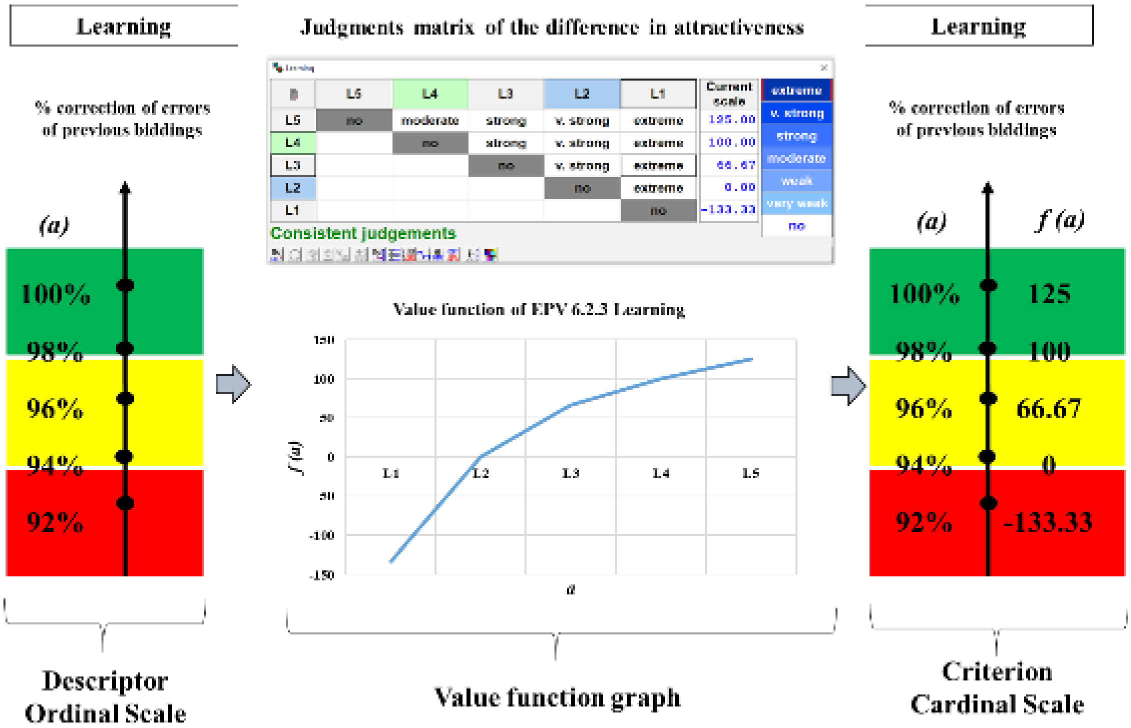

Bidding agents
% of qualified bidding agents
(a)
100%
90%
80%
70%
60%
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5: no, moderate, strong, v. strong, extreme, 125.00
L4: no, strong, v. strong, extreme, 100.00
L3: no, v. strong, extreme, 66.67
L2: no, extreme, 0.00
L1: no, -133.33
extreme, v. strong, strong, moderate, weak, very weak, no
Consistent judgements
Value function of EPV 6.1.2.1 Bidding agents
f (a)
a
L1 L2 L3 L4 L5
Bidding agents
% of qualified bidding agents
(a) f (a)
100% 125
90% 100
80% 66.67
70% 0
60% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

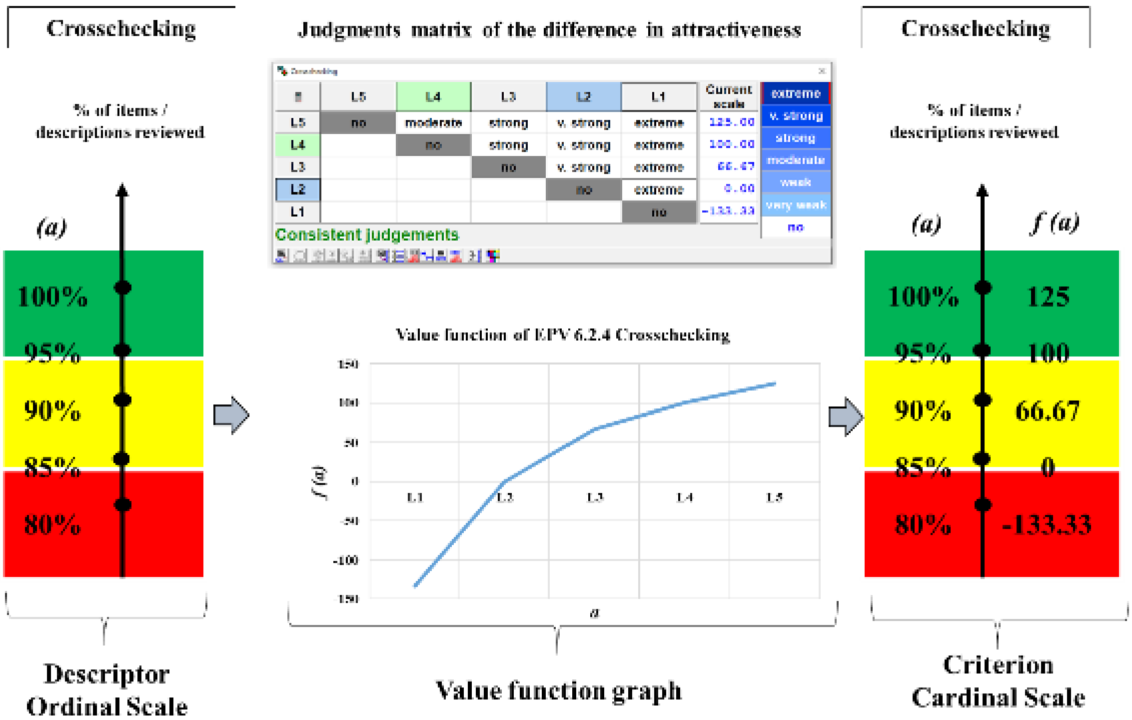

Support Team
Judgments matrix of the difference in attractiveness
Support Team
% of qualified support staff
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
% of qualified support staff
(a)
f (a)
100%
90%
80%
70%
60%
122.22
100
66.67
0
-133.33
Value function of EPV 6.1.2.2 Support Team
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

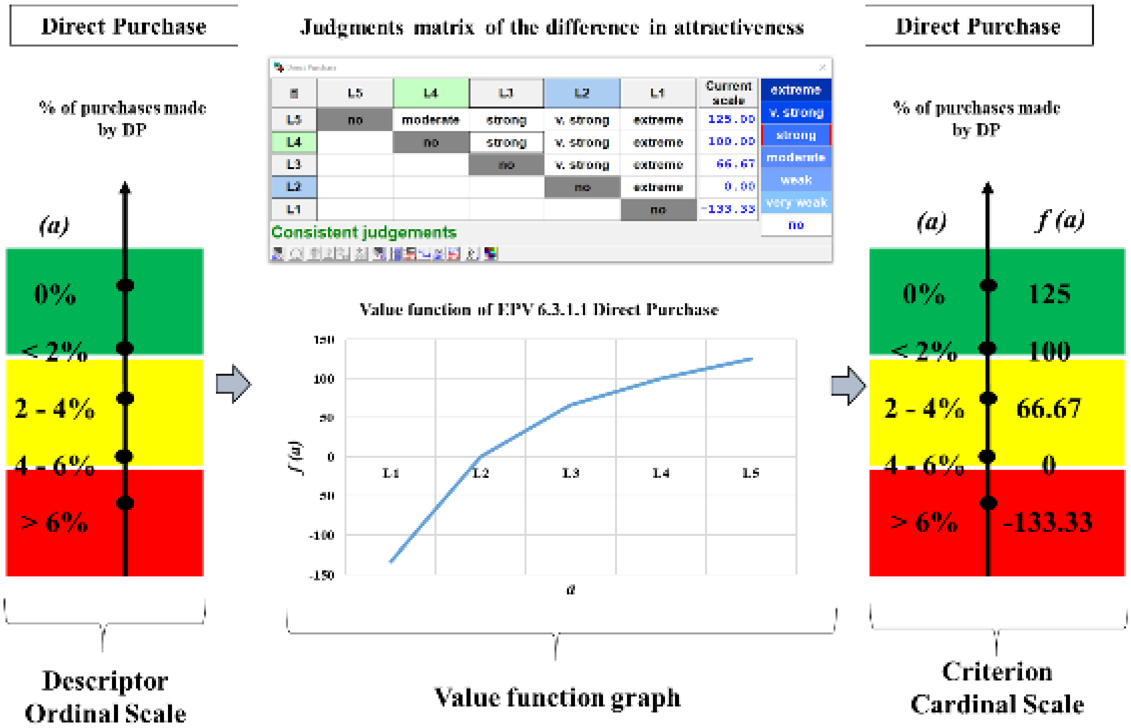

Standardization Commission
Judgments matrix of the difference in attractiveness
Standardization Commission
% of qualified standardization team
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
% of qualified standardization team
(a)
f (a)
100%
90%
80%
70%
60%
122.22
100
66.67
0
-133.33
Value function of EPV 6.1.2.3 Standardization Commission
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Participation
Judgments matrix of the difference in attractiveness
Participation
% participation of assistance teams in the supplies group
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.2.1 Participation
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
% participation of assistance teams in the supplies group
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

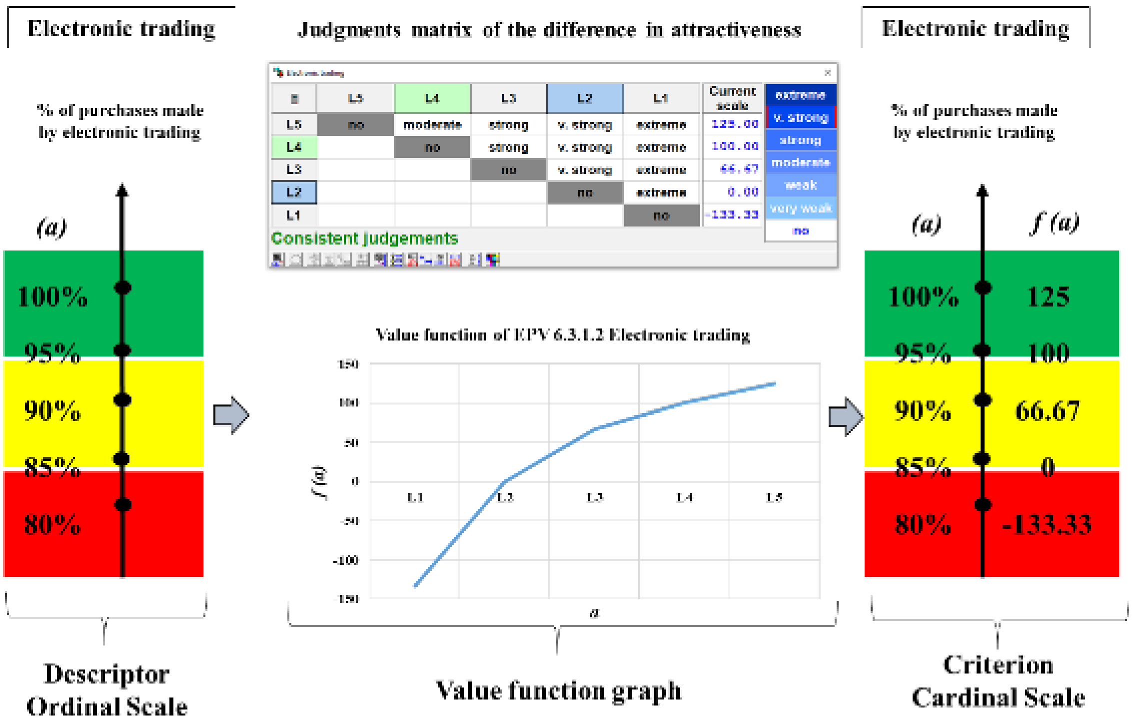

Control
Judgments matrix of the difference in attractiveness
Control
% of descriptions in compliance with legislation
(a)
100%
97.5%
95%
92.5%
90%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.2.2 Control
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
a
% of descriptions in compliance with legislation
(a) f (a)
100% 125
97.5% 100
95% 66.67
92.5% 0
90% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Learning
Judgments matrix of the difference in attractiveness
Learning
% correction of errors of previous biddings
% correction of errors of previous biddings
(a)
100%
98%
96%
94%
92%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.2.3 Learning
f (a)
a
L1 L2 L3 L4 L5
150 100 50 0 -50 -100 -150
(a) f (a)
100% 125
98% 100
96% 66.67
94% 0
92% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

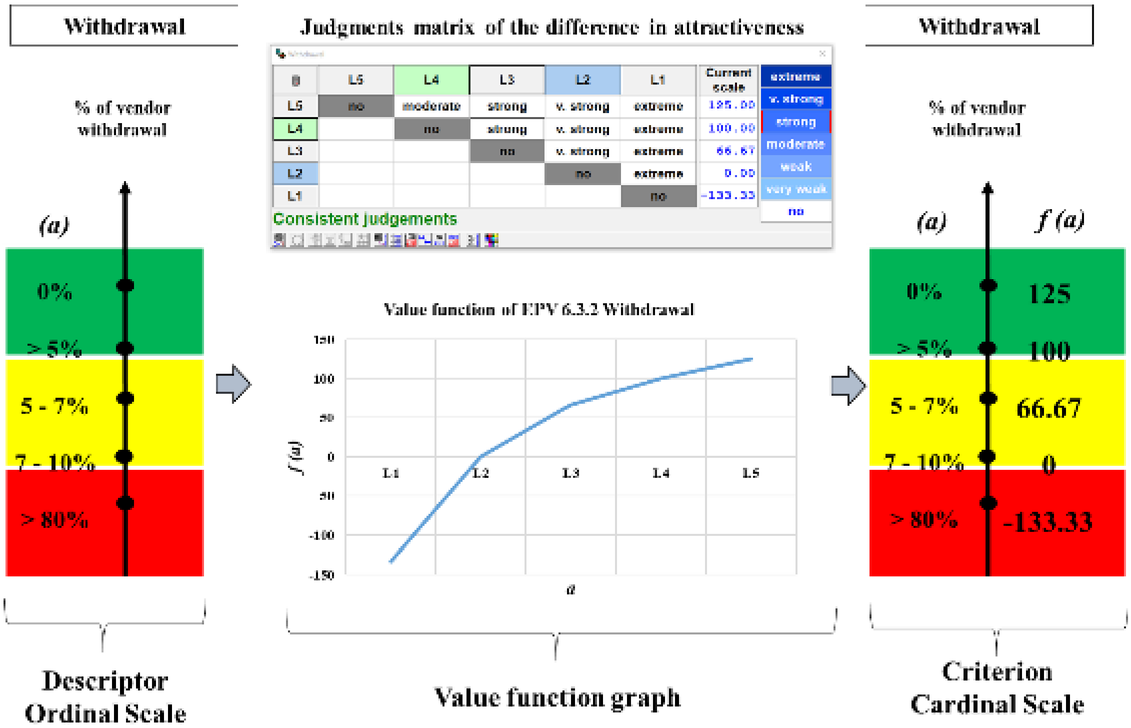

Crosschecking
Judgments matrix of the difference in attractiveness
Crosschecking
% of items / descriptions reviewed
% of items / descriptions reviewed
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.2.4 Crosschecking
f (a)
a
L1 L2 L3 L4 L5
150 100 50 0 -50 -100 -150
(a) f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

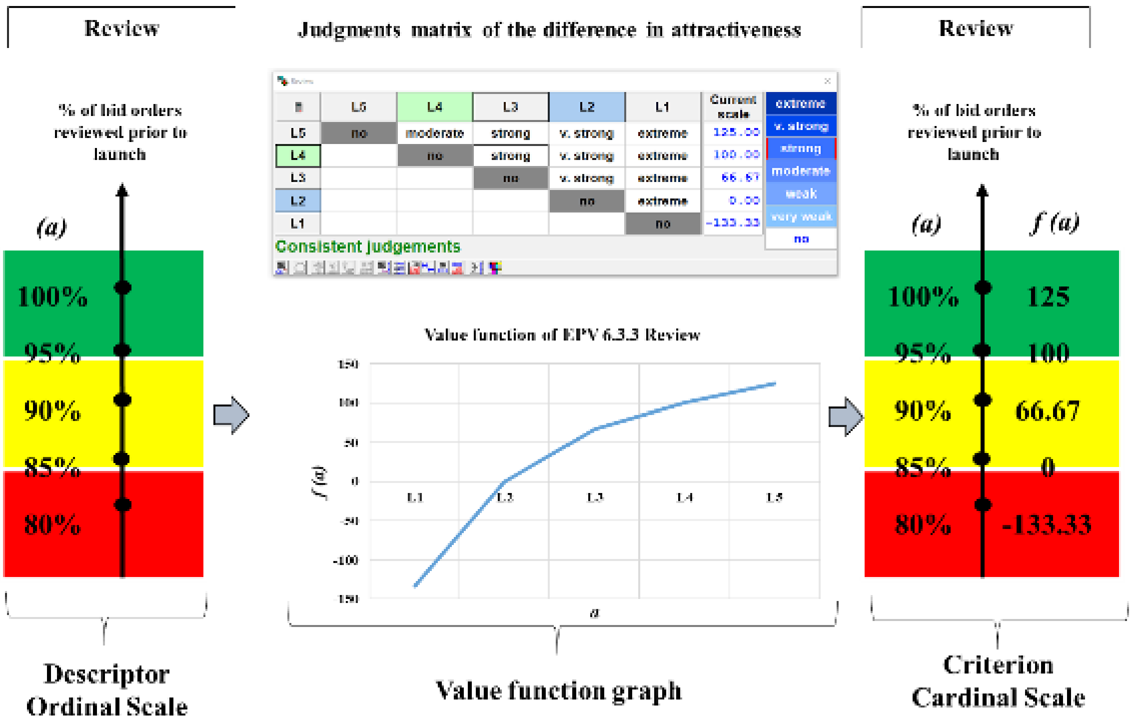


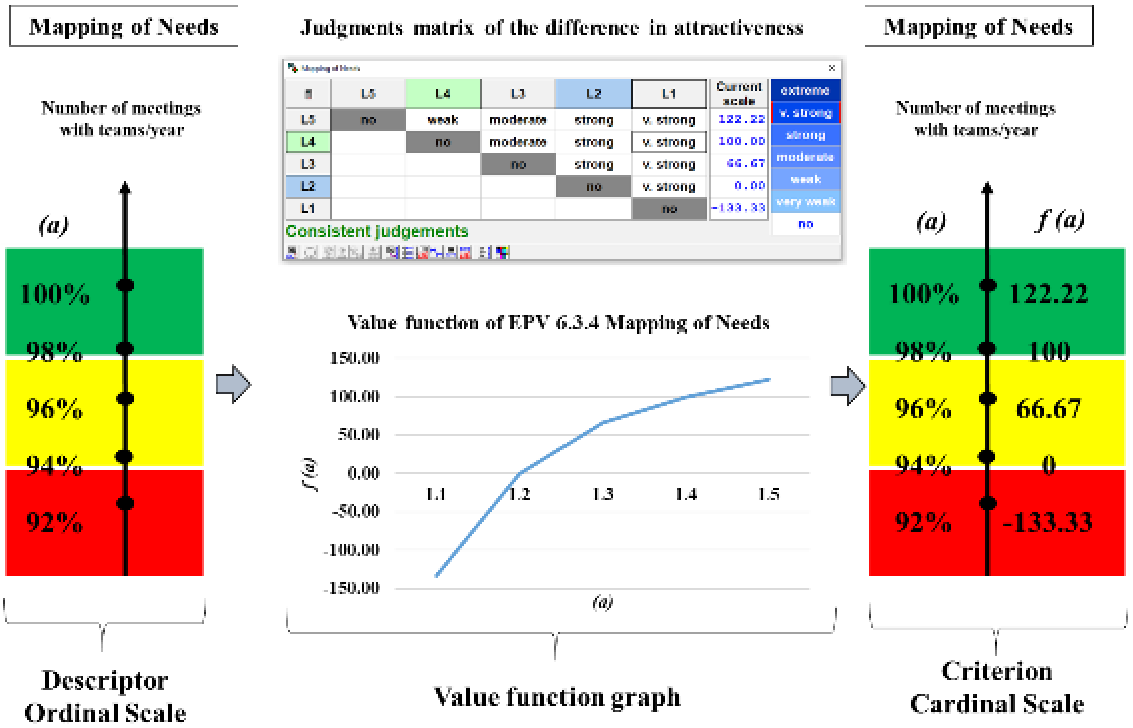
Direct Purchase
Judgments matrix of the difference in attractiveness
Direct Purchase
% of purchases made by DP
% of purchases made by DP
(a)
(a)
f (a)
0%
< 2%
2 - 4%
4 - 6%
> 6%
125
100
66.67
0
-133.33
Consistent judgements
Current scale
extreme
v. strong
strong
moderate
weak
very weak
no
Value function of EPV 6.3.1.1 Direct Purchase
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale



Electronic trading
Judgments matrix of the difference in attractiveness
Electronic trading
% of purchases made by electronic trading
% of purchases made by electronic trading
(a)
(a)
f (a)
100%
95%
90%
85%
80%
125
100
66.67
0
-133.33
Consistent judgements
Current scale
extreme
v. strong
strong
moderate
weak
very weak
no
Value function of EPV 6.3.1.2 Electronic trading
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Withdrawal
Judgments matrix of the difference in attractiveness
Withdrawal
% of vendor withdrawal
(a)
0%
> 5%
5 - 7%
7 - 10%
> 80%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 6.3.2 Withdrawal
f (a)
L1 L2 L3 L4 L5
a
% of vendor withdrawal
(a) f (a)
0% 125
> 5% 100
5 - 7% 66.67
7 - 10% 0
> 80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

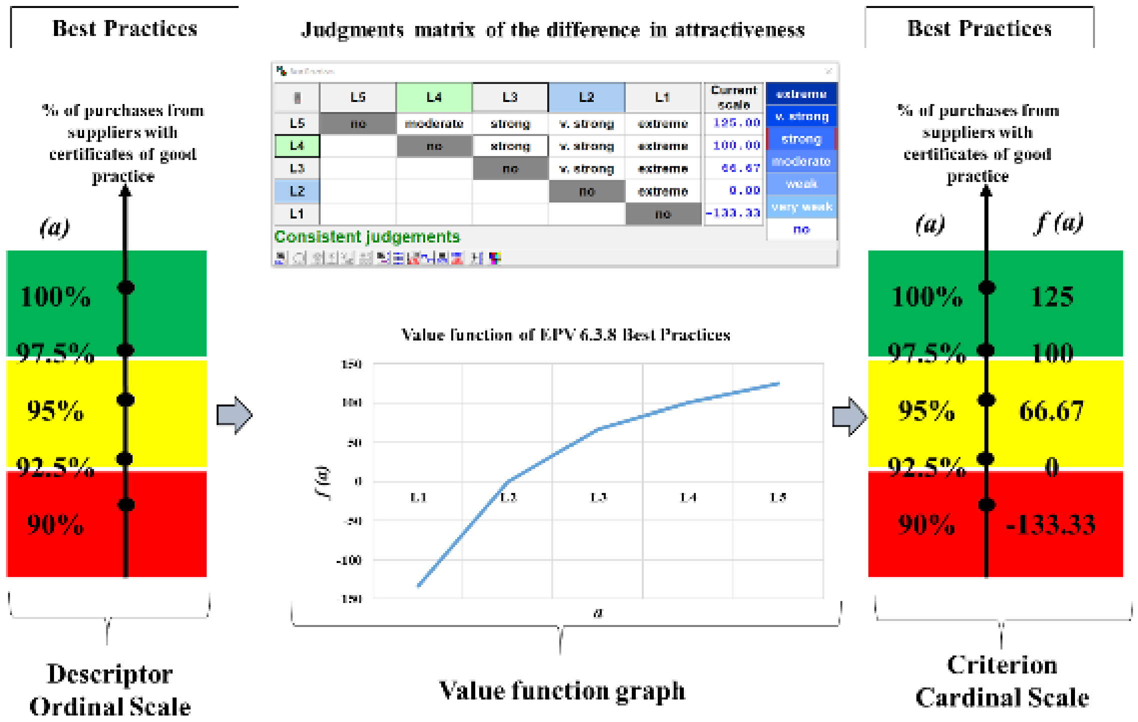

Review
Judgments matrix of the difference in attractiveness
Review
% of bid orders reviewed prior to launch
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 6.3.3 Review
f (a)
L1 L2 L3 L4 L5
a
% of bid orders reviewed prior to launch
(a) f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale



#	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33

extreme / v. strong / strong / moderate / weak / very weak / no

Consistent judgements



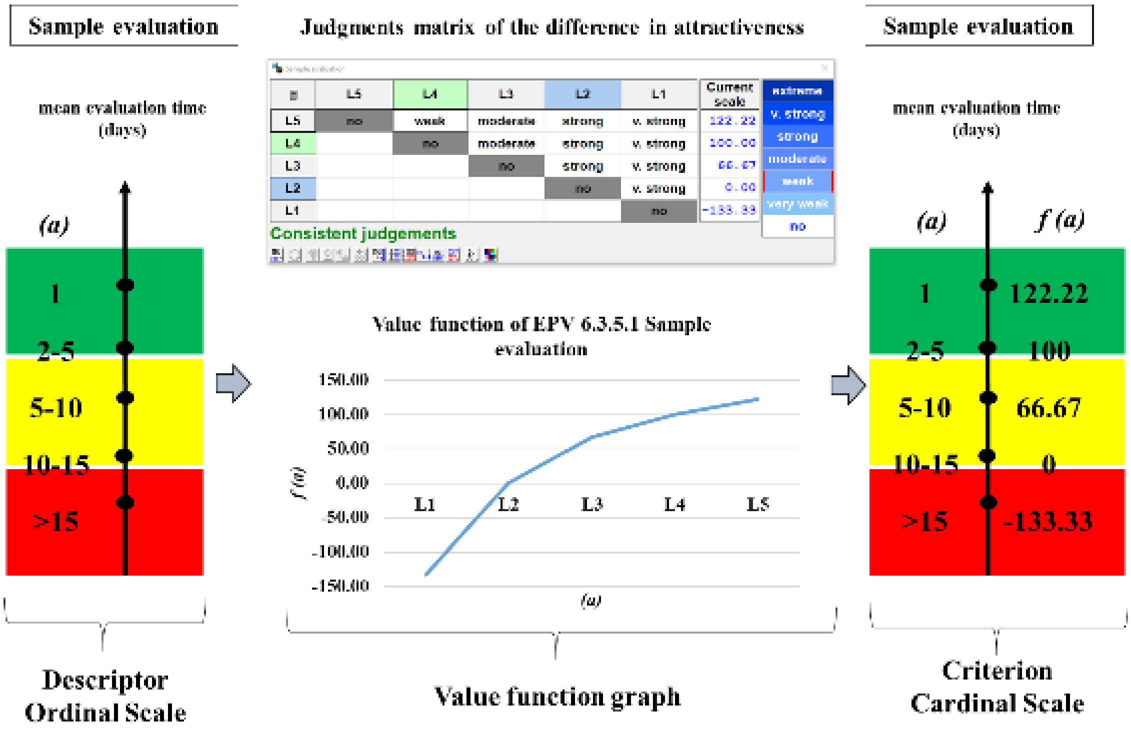
#	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	extreme	0.00
L1					no	-133.33

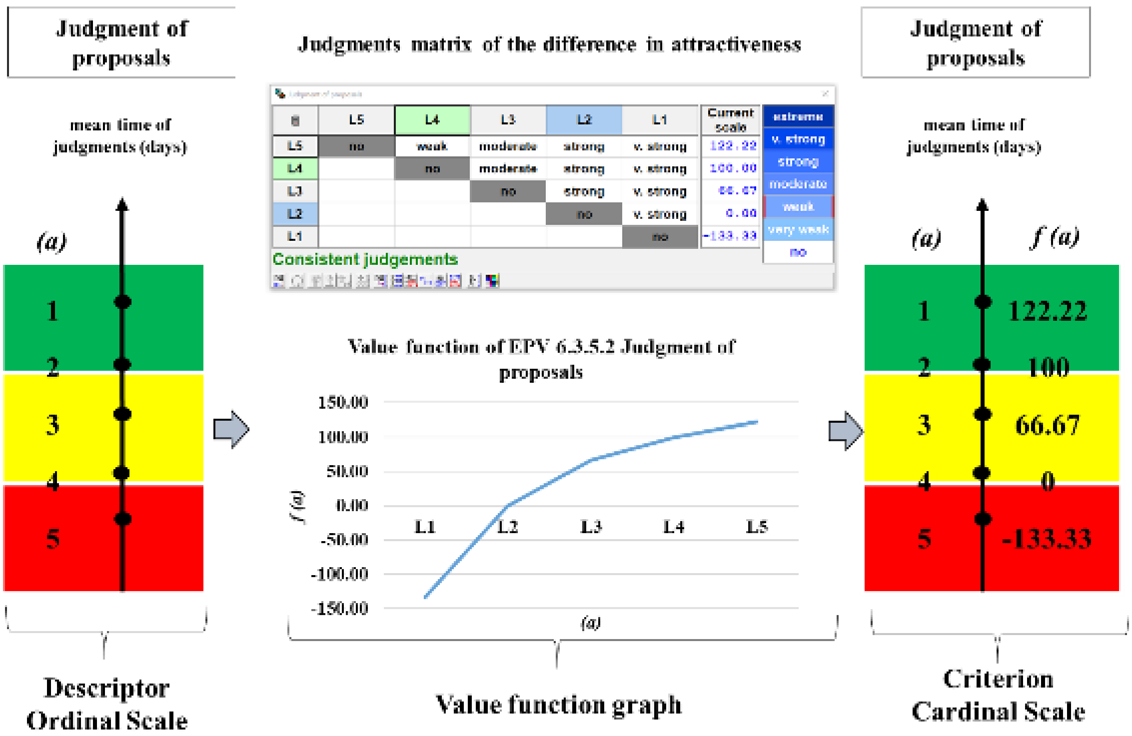
extreme / v. strong / strong / moderate / weak / very weak / no

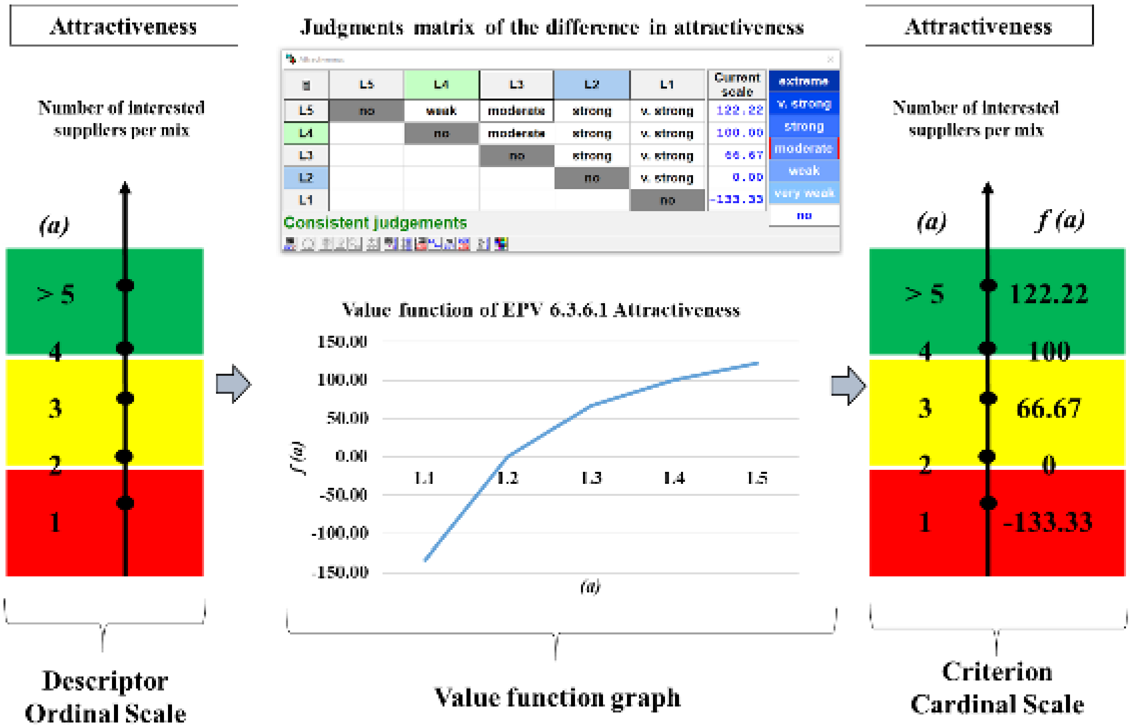
Consistent judgements

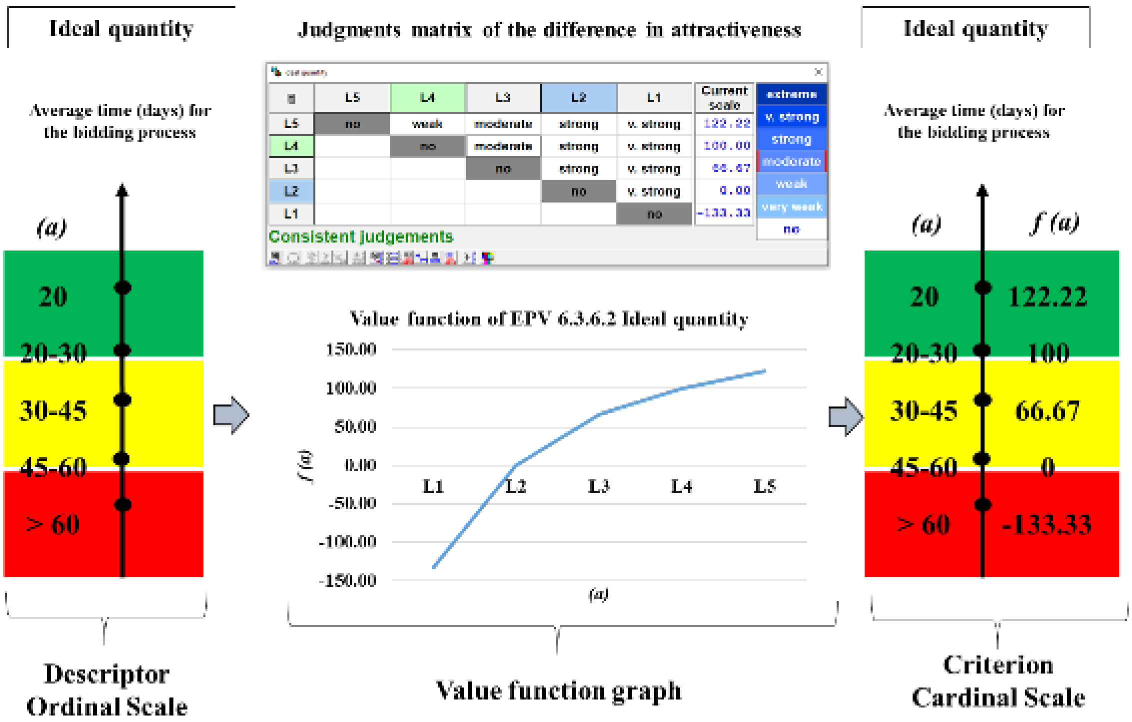
jhhj

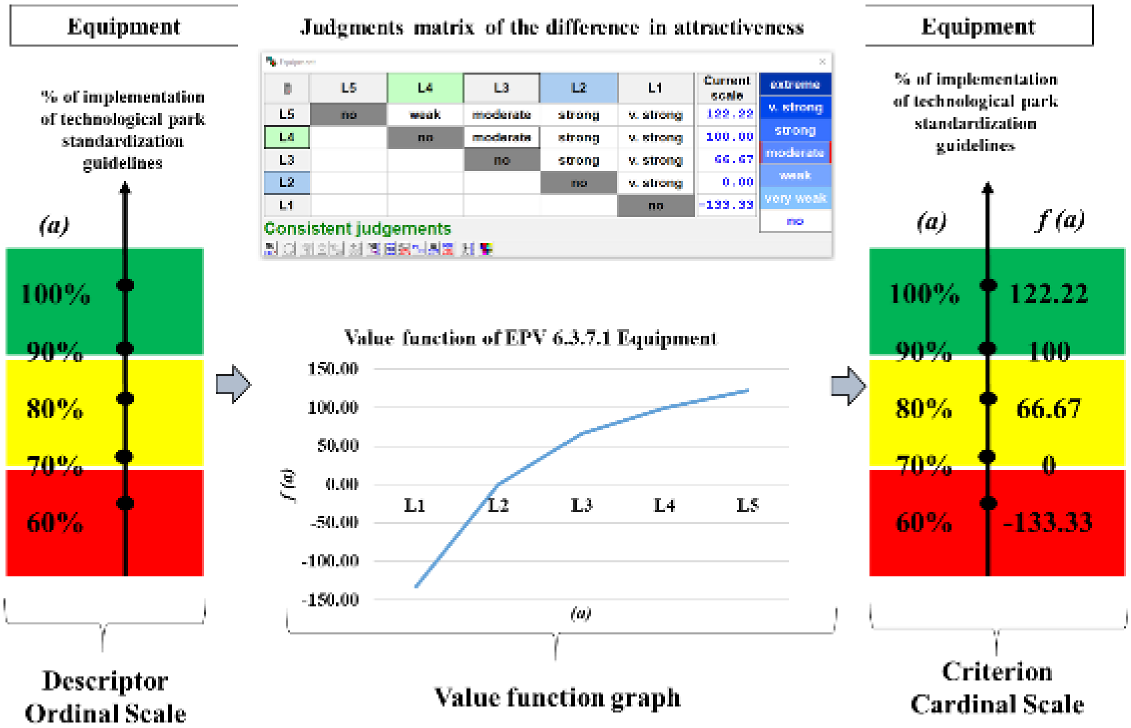
grfgrrgtfrg

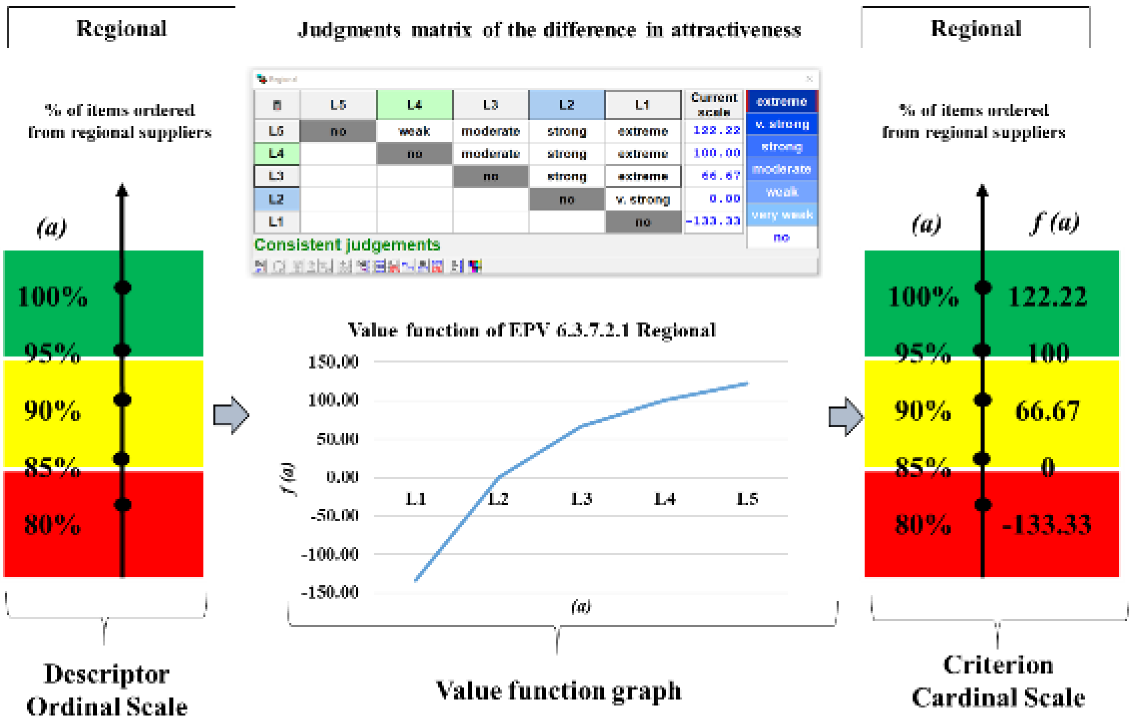

Sample evaluation
Judgments matrix of the difference in attractiveness
Sample evaluation
mean evaluation time (days)
(a)
1
2-5
5-10
10-15
>15
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.5.1 Sample evaluation
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
mean evaluation time (days)
(a) f (a)
1 122.22
2-5 100
5-10 66.67
10-15 0
>15 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

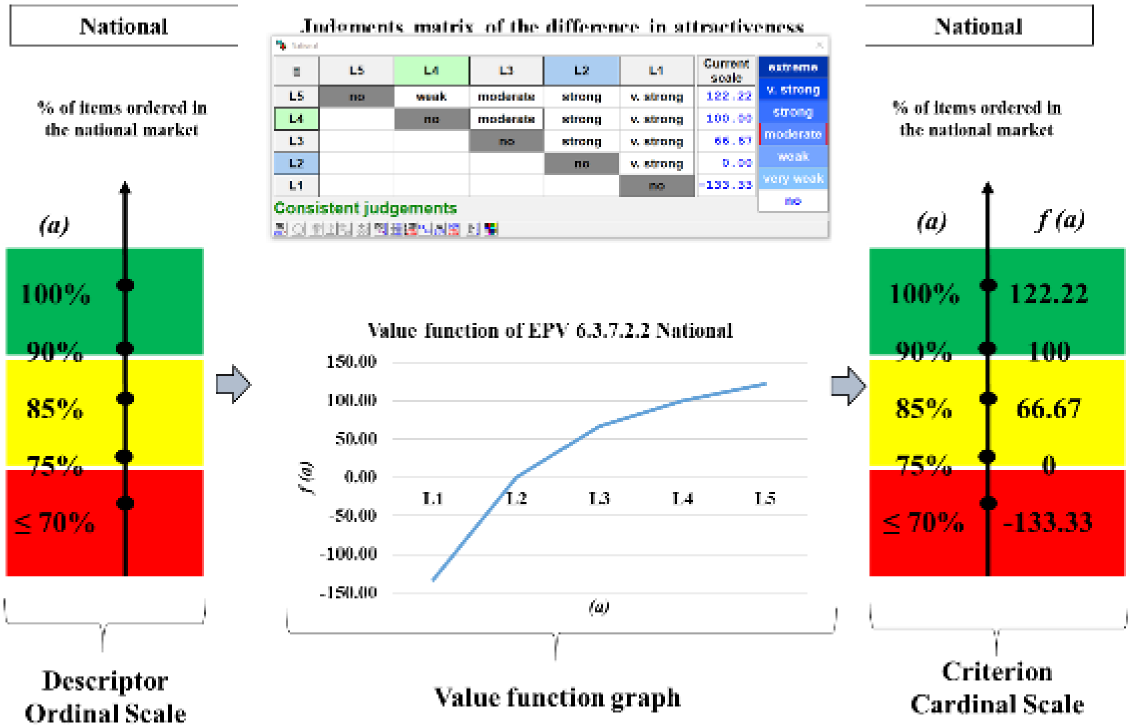

Judgment of proposals
Judgments matrix of the difference in attractiveness
Judgment of proposals
mean time of judgments (days)
(a)
1
2
3
4
5
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.5.2 Judgment of proposals
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
mean time of judgments (days)
(a) f (a)
1 122.22
2 100
3 66.67
4 0
5 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

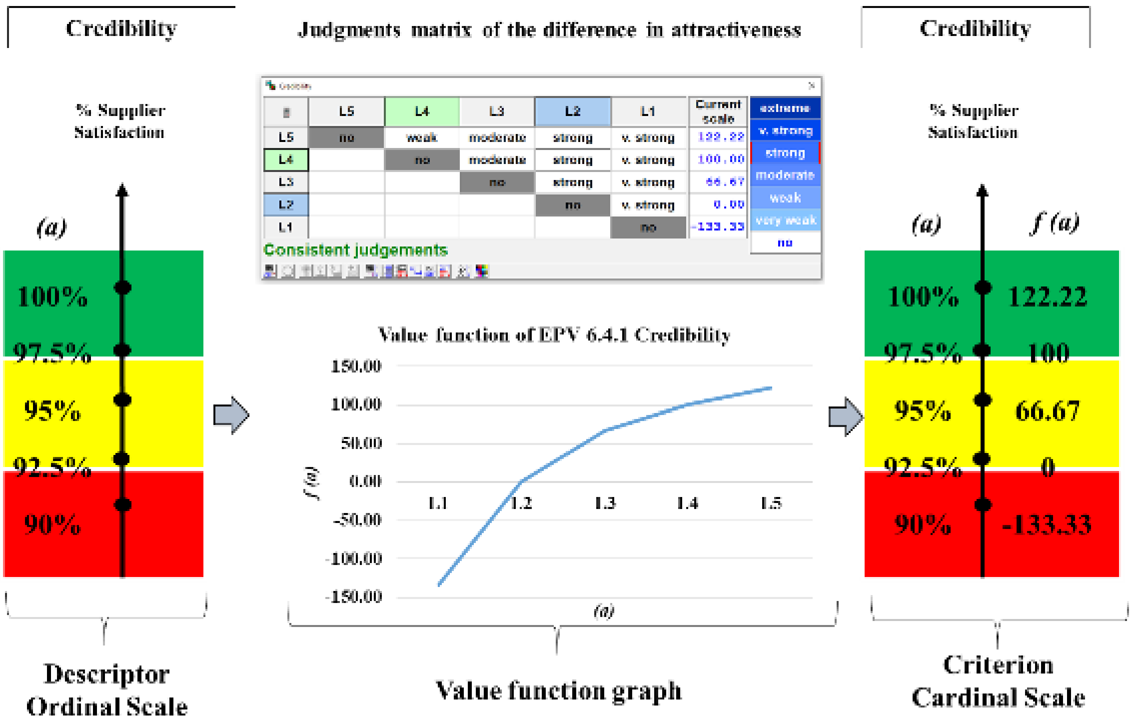

Attractiveness
Number of interested suppliers per mix
(a)
> 5
4
3
2
1
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.6.1 Attractiveness
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Attractiveness
Number of interested suppliers per mix
(a) f (a)
> 5 122.22
4 100
3 66.67
2 0
1 -133.33
Criterion Cardinal Scale

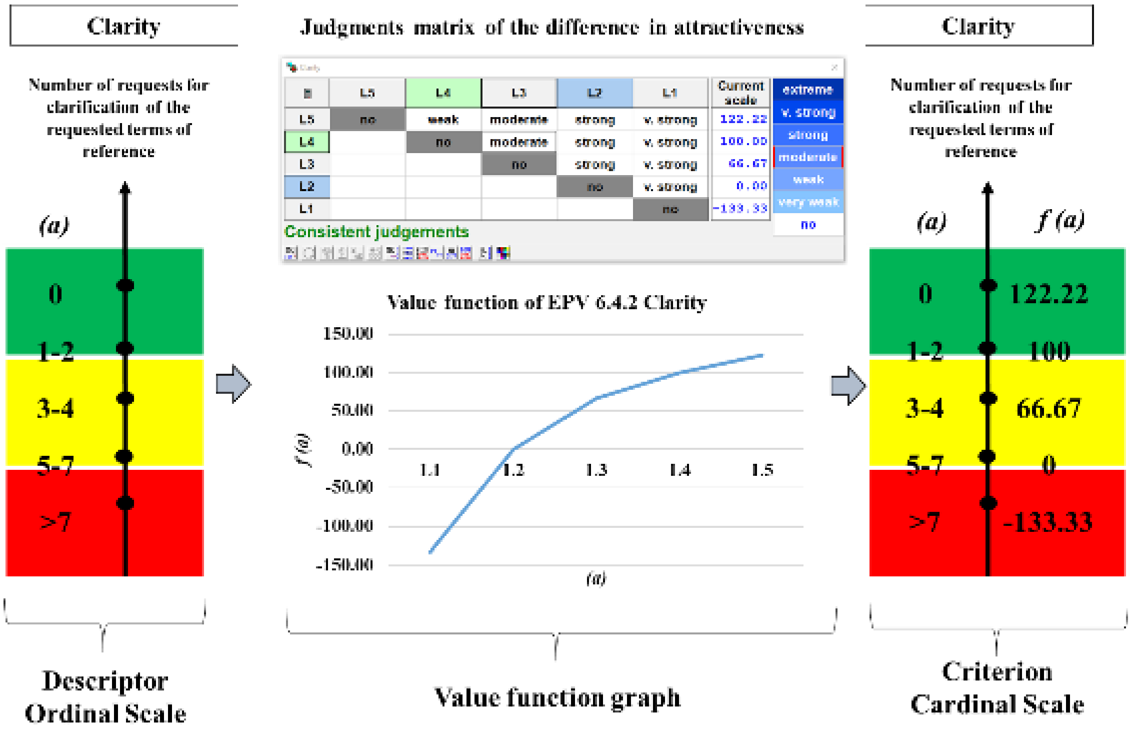

Ideal quantity
Average time (days) for the bidding process
(a)
20
20-30
30-45
45-60
> 60
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.6.2 Ideal quantity
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Ideal quantity
Average time (days) for the bidding process
(a) f (a)
20 122.22
20-30 100
30-45 66.67
45-60 0
> 60 -133.33
Criterion Cardinal Scale


Equipment
% of implementation of technological park standardization guidelines
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.7.1 Equipment
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Equipment
% of implementation of technological park standardization guidelines
(a) f (a)
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Criterion Cardinal Scale


Regional
% of items ordered from regional suppliers
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong extreme 122.22
L4 no moderate strong extreme 100.00
L3 no strong extreme 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.3.7.2.1 Regional
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Regional
% of items ordered from regional suppliers
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale

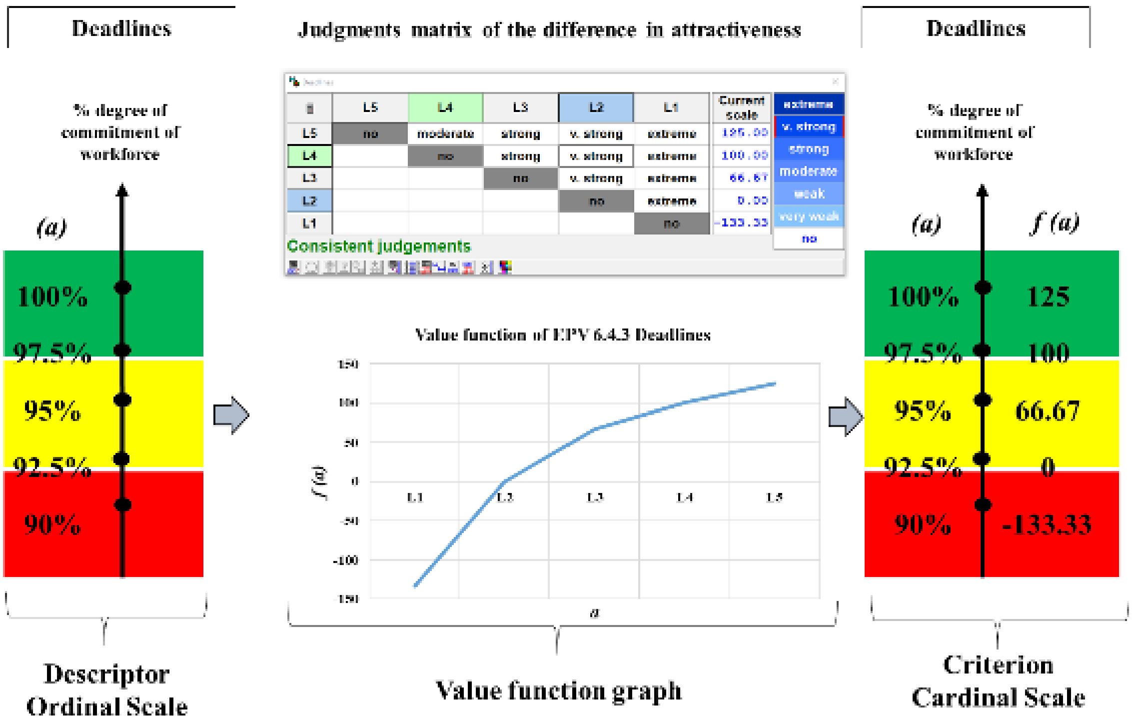

National
% of items ordered in the national market
(a)
100%
90%
85%
75%
≤ 70%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 6.3.7.2.2 National
150.00 100.00 50.00 0.00 -50.00 -100.00 -150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
National
% of items ordered in the national market
(a) f (a)
100% 122.22
90% 100
85% 66.67
75% 0
≤ 70% -133.33
Criterion Cardinal Scale


Credibility
% Supplier Satisfaction
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme v. strong strong moderate weak very weak no
Consistent judgements
Value function of EPV 6.4.1 Credibility
150.00 100.00 50.00 0.00 -50.00 -100.00 -150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Credibility
% Supplier Satisfaction
(a) f (a)
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -133.33
Criterion Cardinal Scale



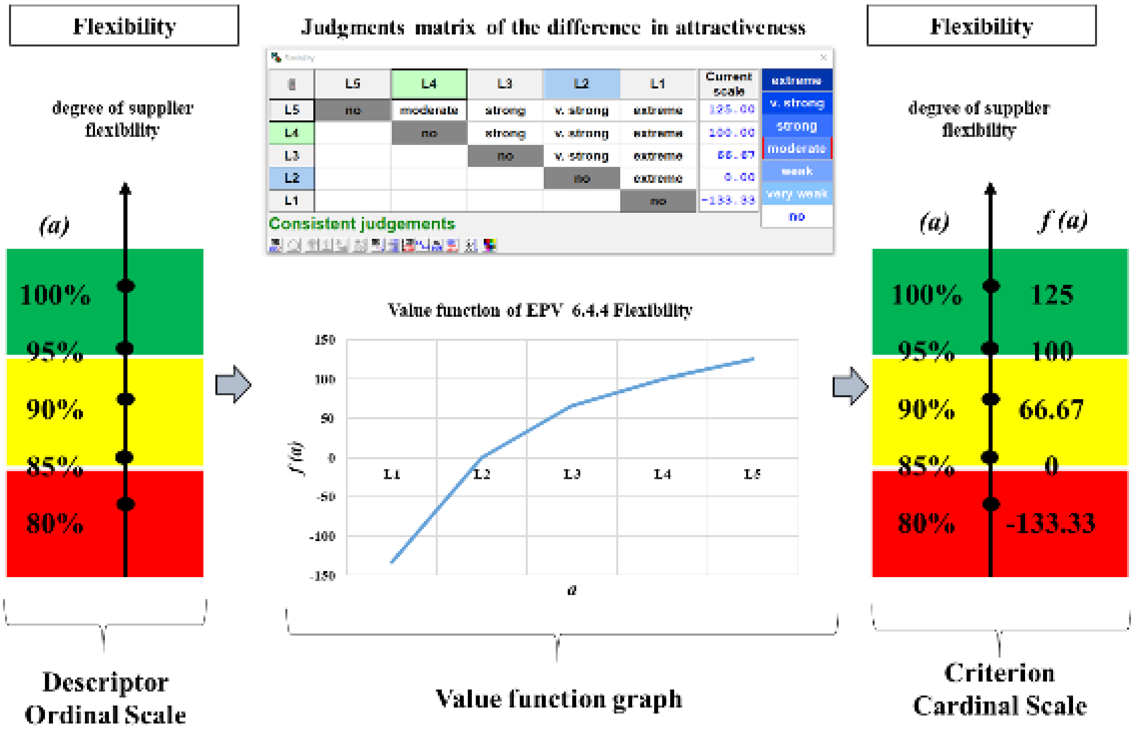
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33

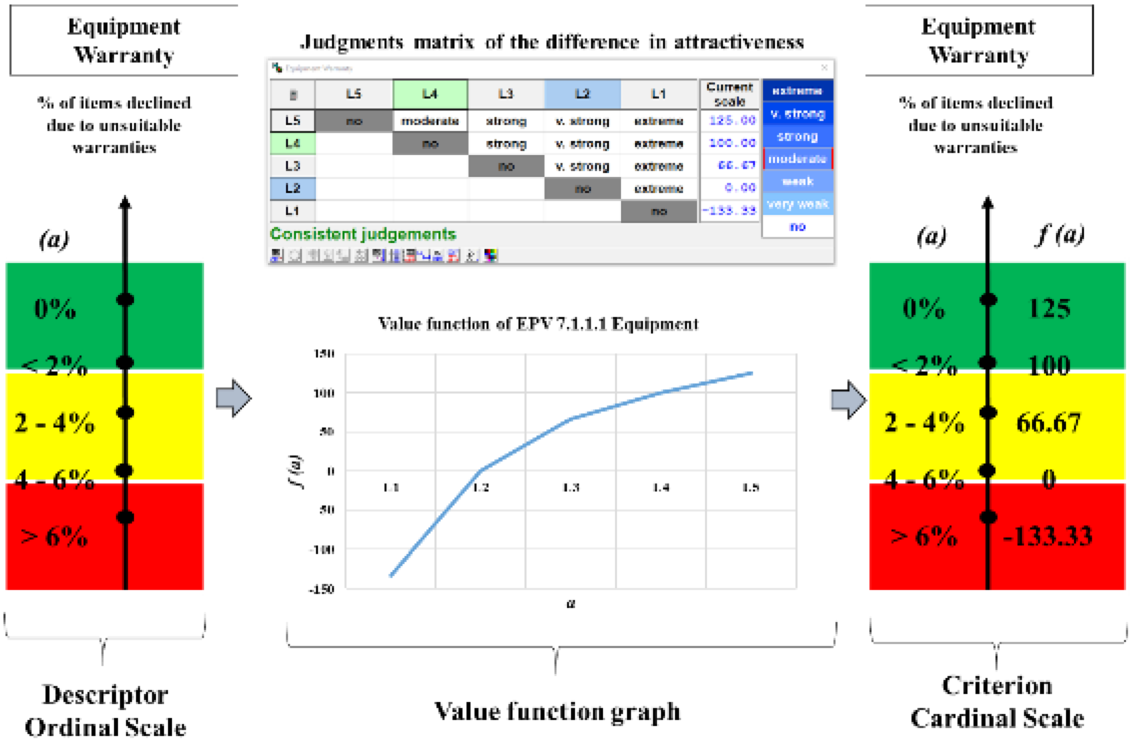
extreme
v. strong
strong
moderate
weak
very weak
no

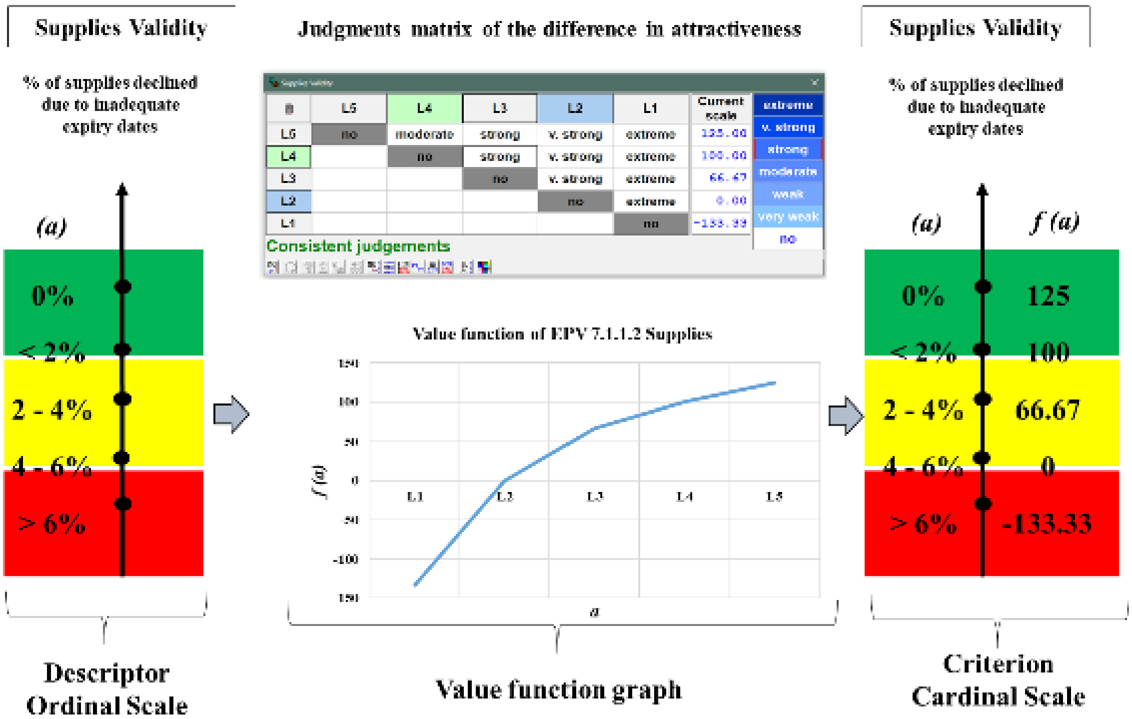


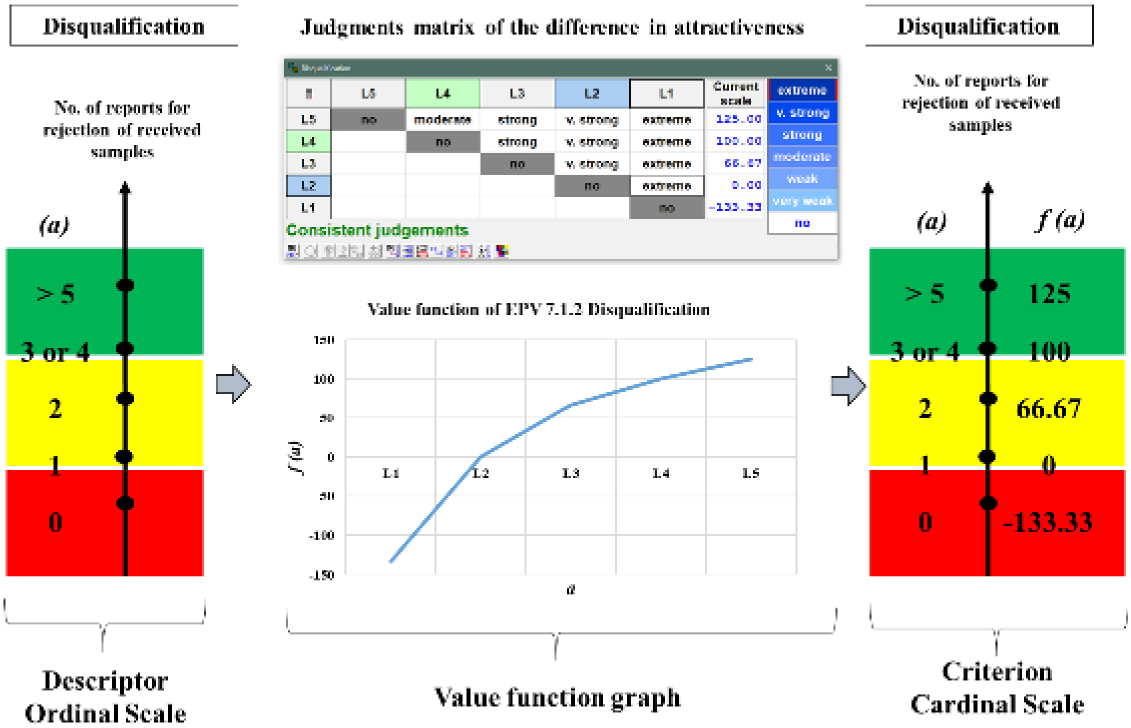
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	extreme	0.00
L1					no	-133.33

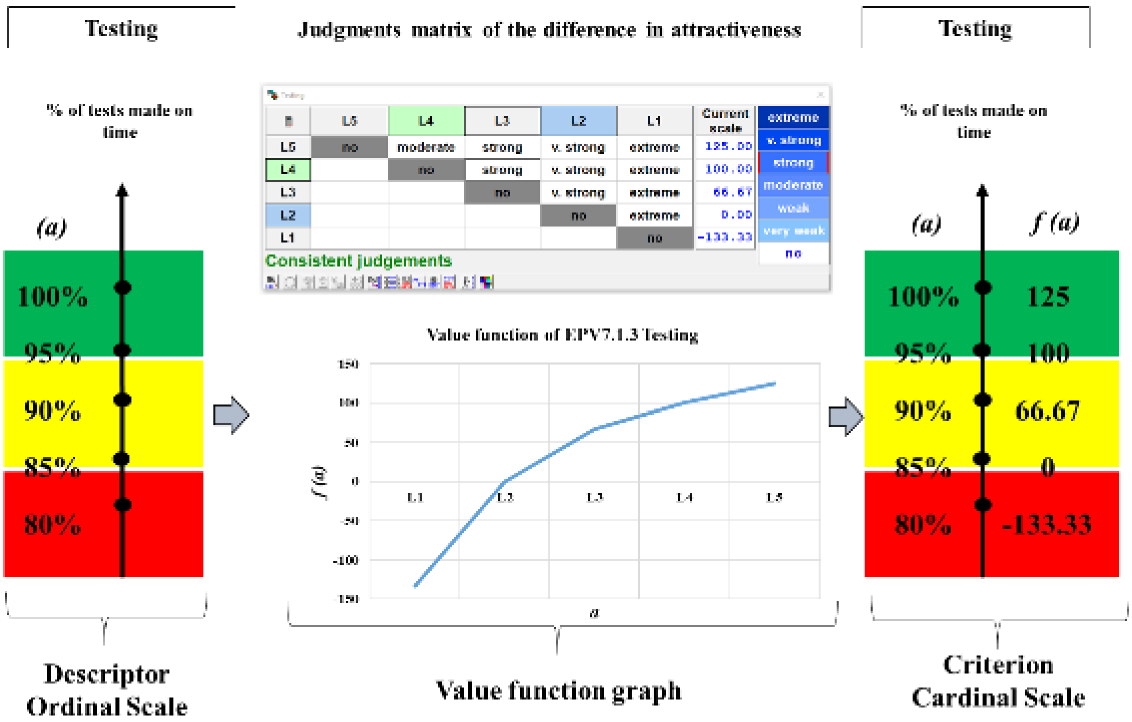
extreme
v. strong
strong
moderate
weak
very weak
no

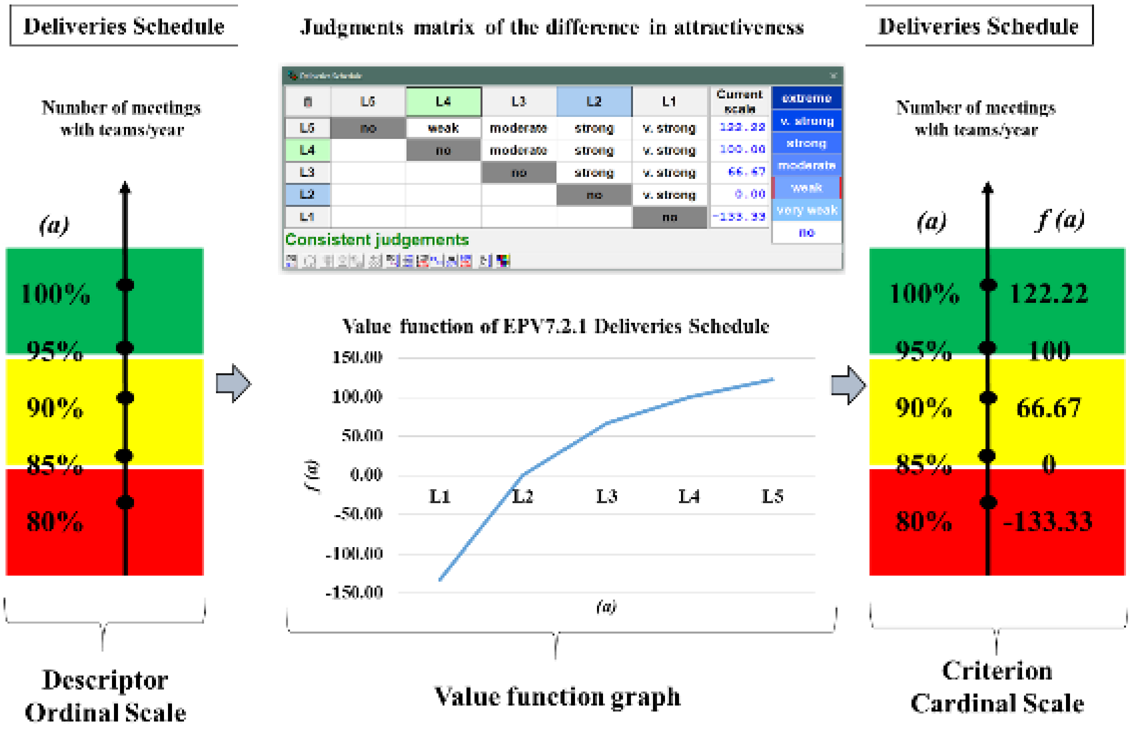

Flexibility
degree of supplier flexibility
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
moderate
strong
v. strong
extreme
125.00
100.00
66.67
0.00
-133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 6.4.4 Flexibility
150
100
50
0
-50
-100
-150
f (a)
a
Value function graph
Flexibility
degree of supplier flexibility
(a)
f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale


Equipment Warranty
% of items declined due to unsuitable warranties
(a)
0%
< 2%
2 - 4%
4 - 6%
> 6%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.1.1.1 Equipment
150
100
50
0
-50
-100
-150
L1 L2 L3 L4 L5
f (a)
a
Value function graph
Equipment Warranty
% of items declined due to unsuitable warranties
(a) f (a)
0% 125
< 2% 100
2 - 4% 66.67
4 - 6% 0
> 6% -133.33
Criterion Cardinal Scale

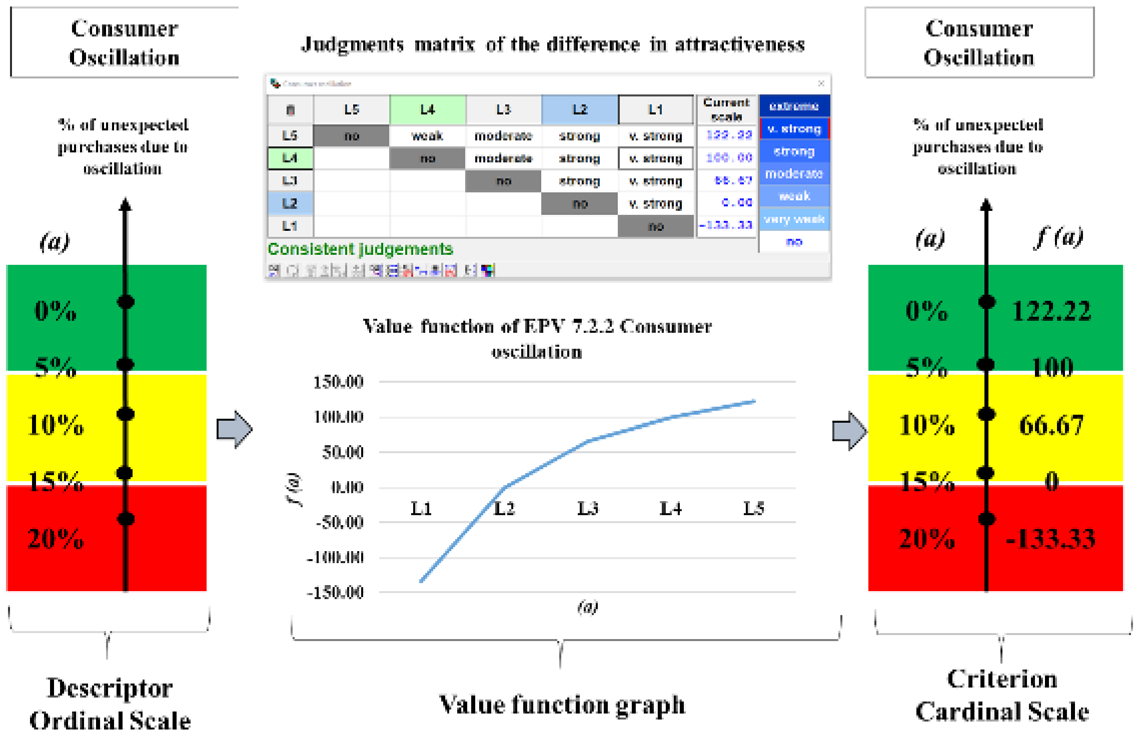

Supplies Validity
% of supplies declined due to inadequate expiry dates
(a)
0%
< 2%
2 - 4%
4 - 6%
> 6%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.1.1.2 Supplies
150
100
50
0
-50
-100
-150
L1 L2 L3 L4 L5
f (a)
a
Value function graph
Supplies Validity
% of supplies declined due to inadequate expiry dates
(a) f (a)
0% 125
< 2% 100
2 - 4% 66.67
4 - 6% 0
> 6% -133.33
Criterion Cardinal Scale


Disqualification
Judgments matrix of the difference in attractiveness
Disqualification
No. of reports for rejection of received samples
(a)
> 5
3 or 4
2
1
0
Consistent judgements
Value function of EPV 7.1.2 Disqualification
f (a)
a
L1
L2
L3
L4
L5
No. of reports for rejection of received samples
(a)
f (a)
125
100
66.67
0
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

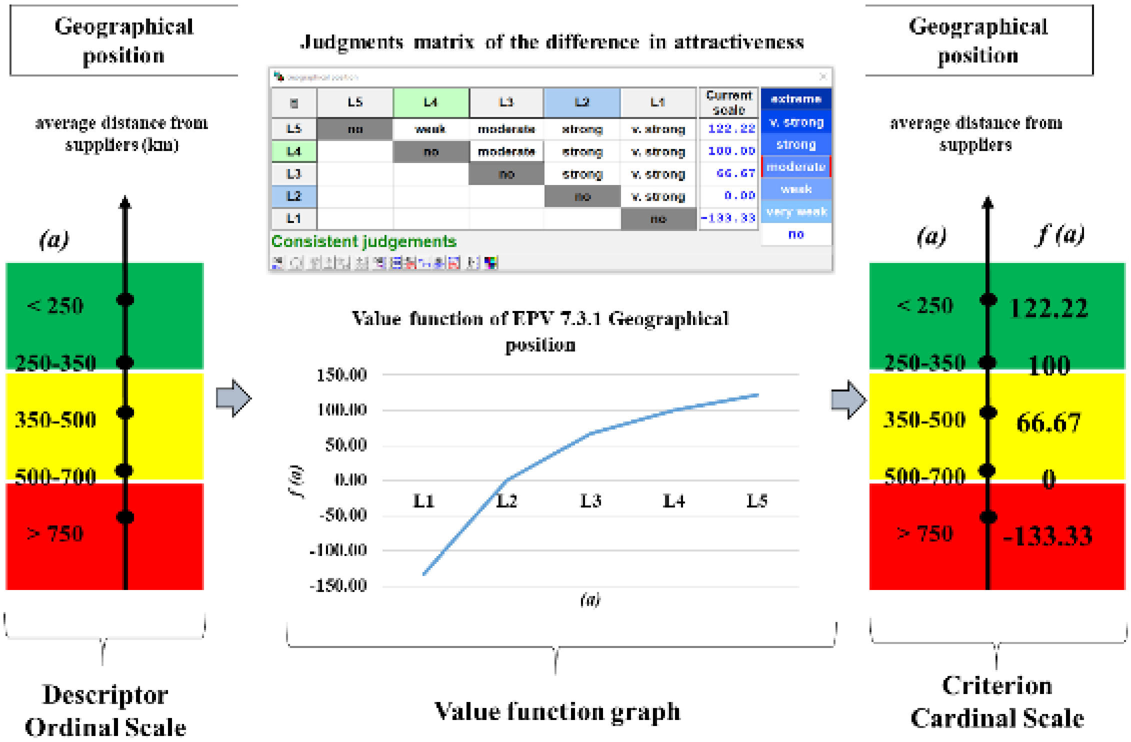

Testing
Judgments matrix of the difference in attractiveness
Testing
% of tests made on time
(a)
100%
95%
90%
85%
80%
Consistent judgements
Value function of EPV7.1.3 Testing
f (a)
a
L1
L2
L3
L4
L5
% of tests made on time
(a)
f (a)
125
100
66.67
0
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

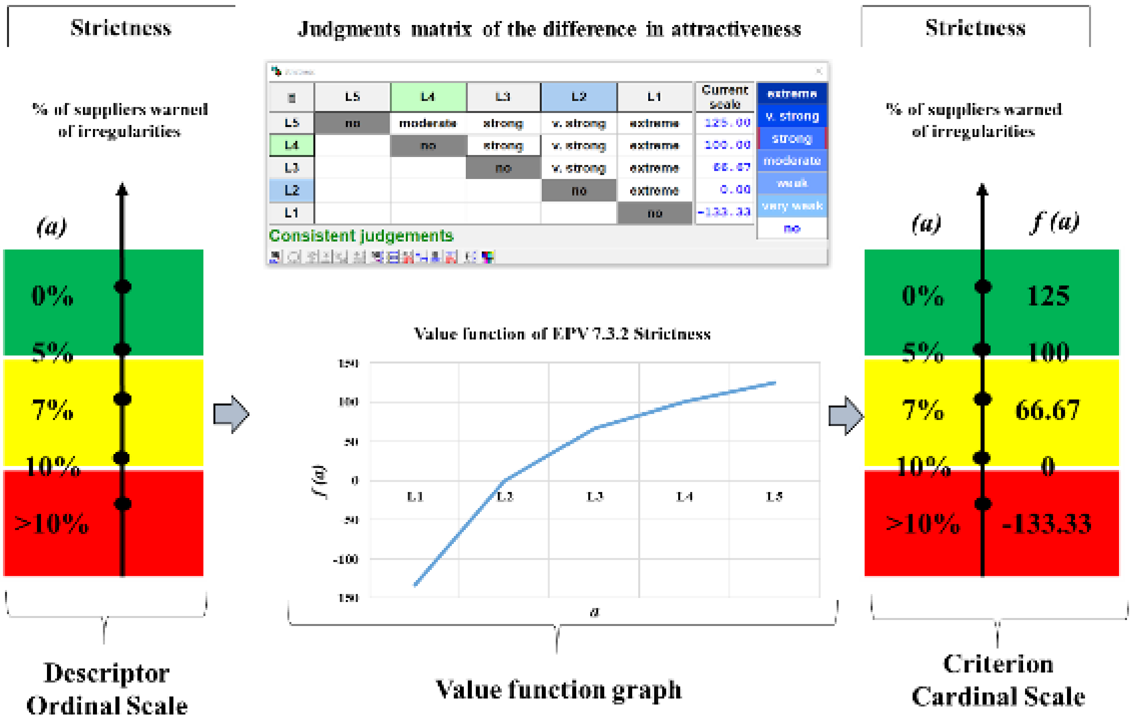


	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33



	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33


Geographical position
average distance from suppliers (km)
(a)
< 250
250-350
350-500
500-700
> 750
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.3.1 Geographical position
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Geographical position
average distance from suppliers
(a) f (a)
< 250 122.22
250-350 100
350-500 66.67
500-700 0
> 750 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Strictness
% of suppliers warned of irregularities
(a)
0%
5%
7%
10%
>10%
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.3.2 Strictness
f (a)
L1 L2 L3 L4 L5
a
Strictness
% of suppliers warned of irregularities
(a) f (a)
0% 125
5% 100
7% 66.67
10% 0
>10% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

Attention to errors

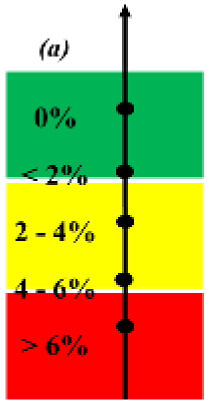
Judgments matrix of the difference in attractiveness

#	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	extreme	0.00
L1					no	-133.33

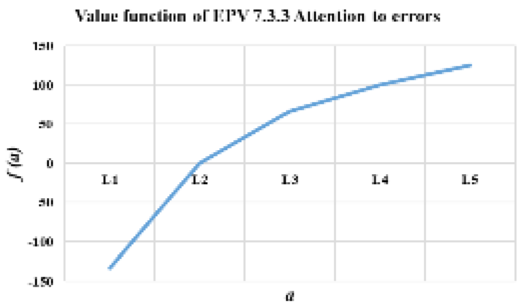
extreme / v. strong / strong / moderate / weak / very weak / no

Consistent judgements

% of contracts with errors



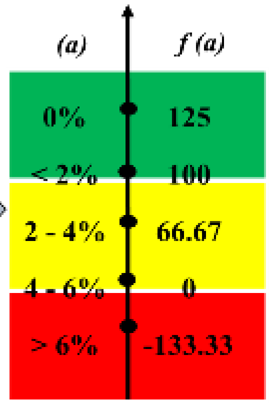
Descriptor Ordinal Scale



Value function graph

Attention to errors

% of contracts with errors



Criterion Cardinal Scale

Unblemished Conduct

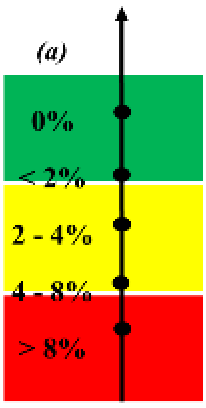
Judgments matrix of the difference in attractiveness

#	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	extreme	0.00
L1					no	-133.33

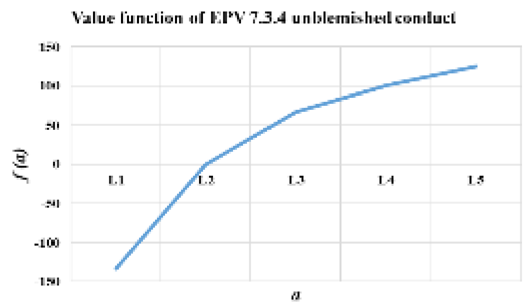
extreme / v. strong / strong / moderate / weak / very weak / no

Consistent judgements

% of suppliers punished according to law



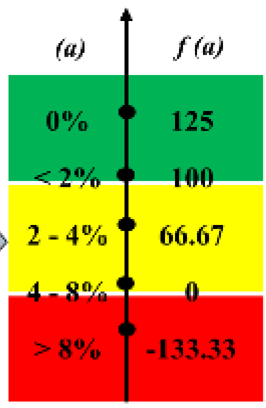
Descriptor Ordinal Scale



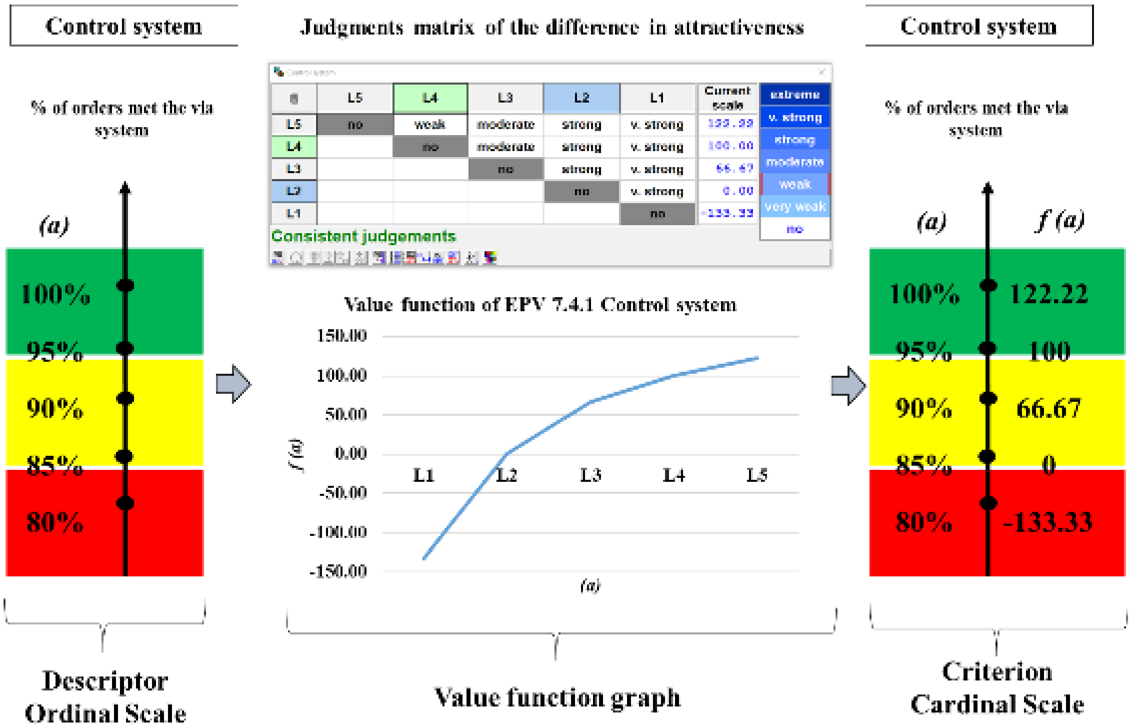
Value function graph

Unblemished Conduct

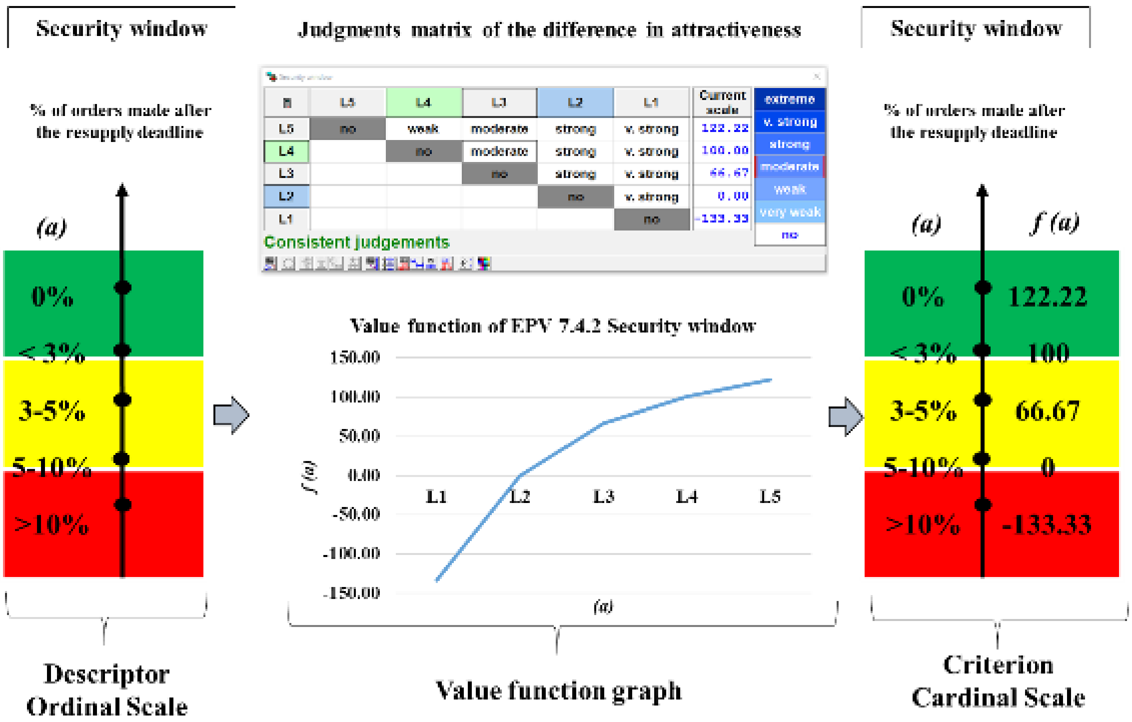
% of suppliers punished according to law



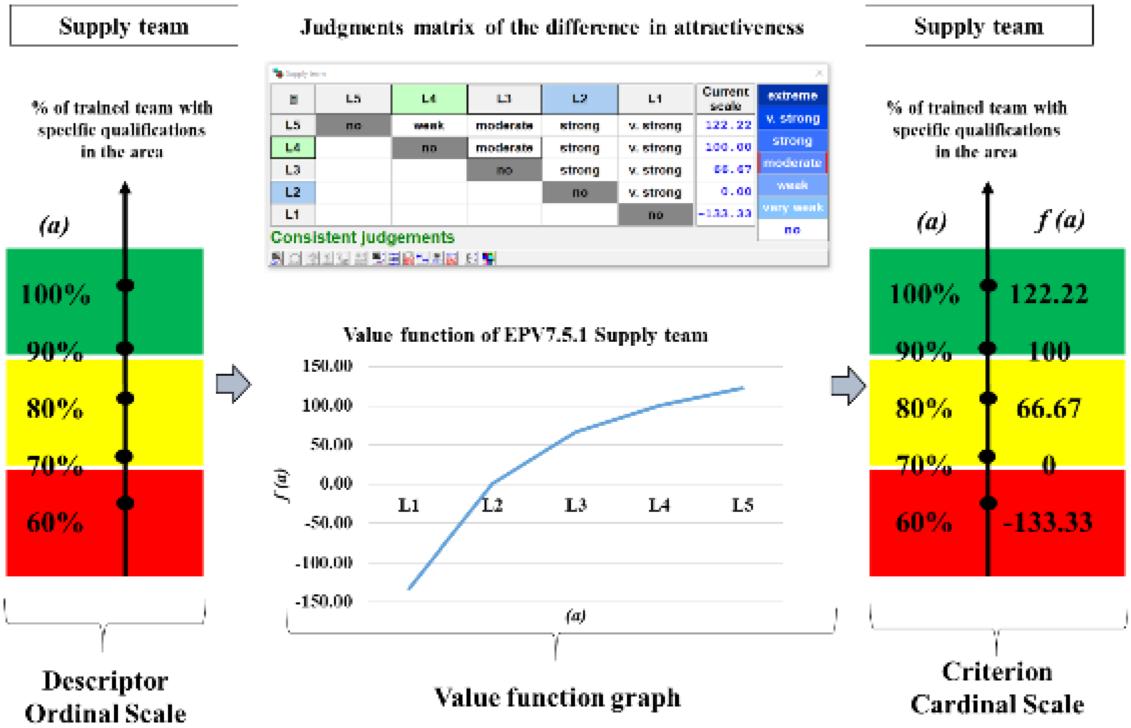
Criterion Cardinal Scale

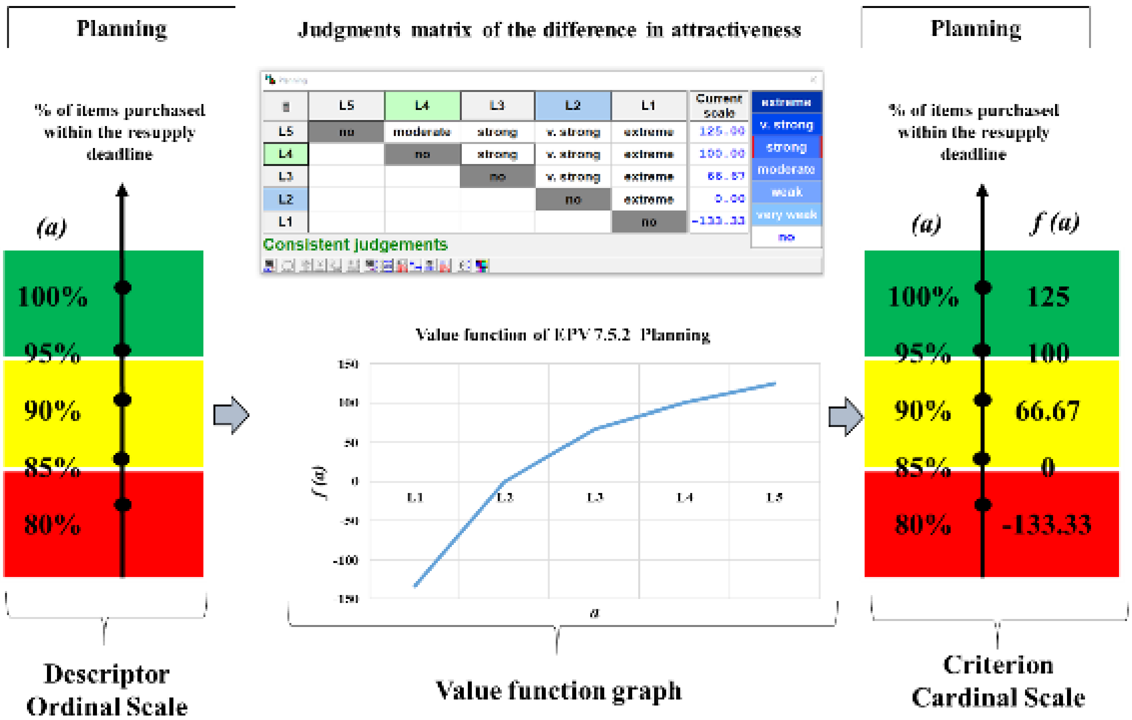


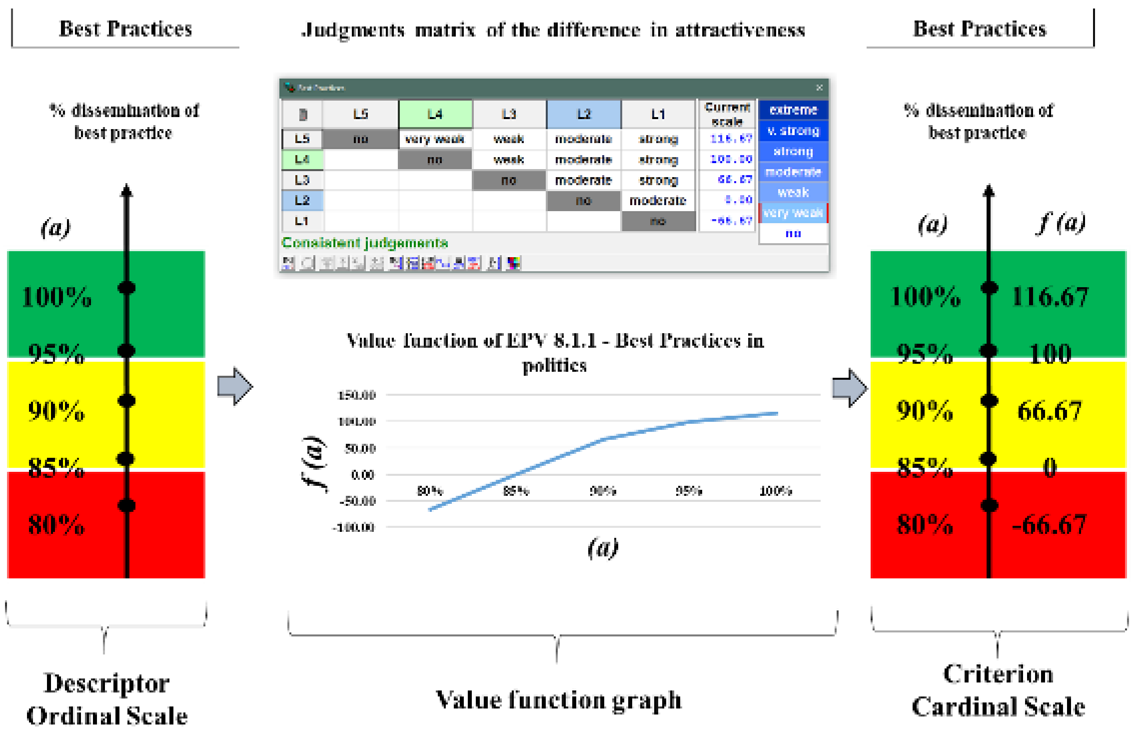
Control system
Judgments matrix of the difference in attractiveness
Control system
% of orders met the vla system
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.4.1 Control system
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
% of orders met the vla system
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

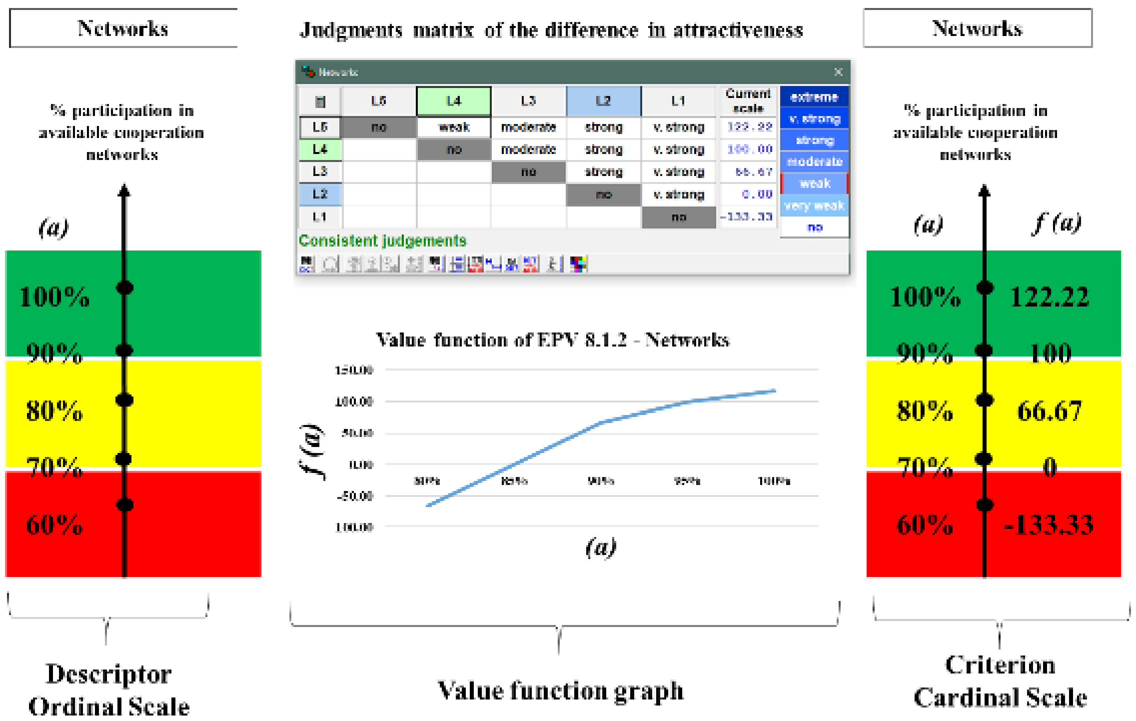


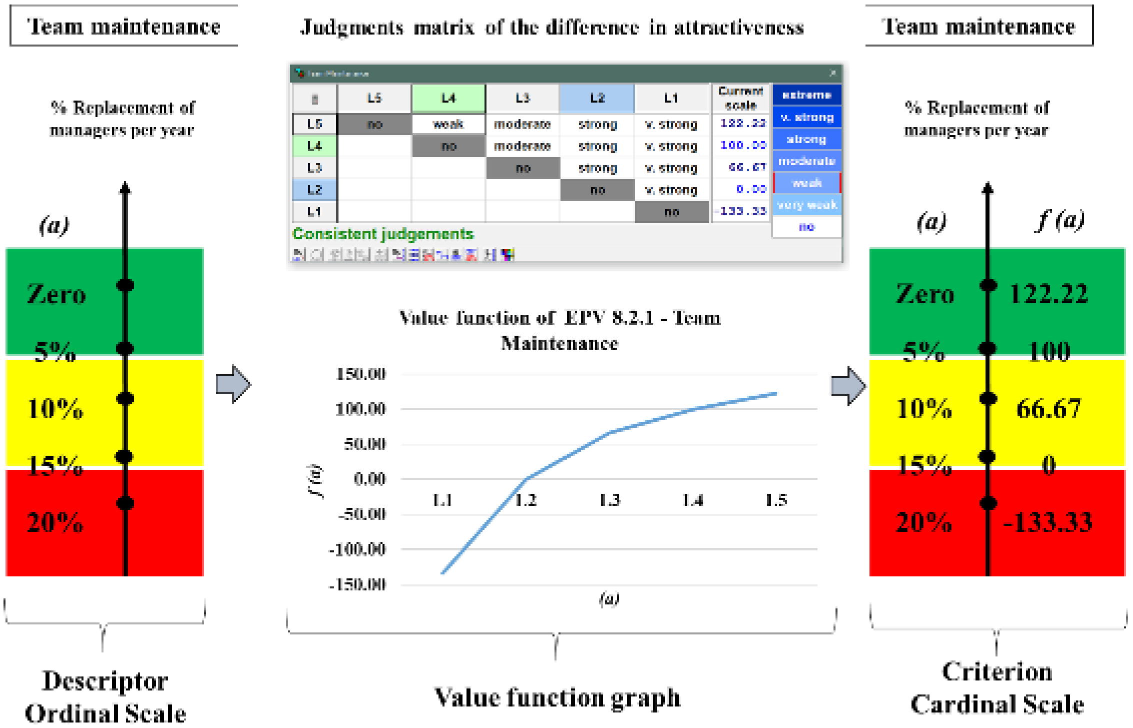
Security window
Judgments matrix of the difference in attractiveness
Security window
% of orders made after the resupply deadline
(a)
0%
< 3%
3-5%
5-10%
>10%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 7.4.2 Security window
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
% of orders made after the resupply deadline
(a) f (a)
0% 122.22
< 3% 100
3-5% 66.67
5-10% 0
>10% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

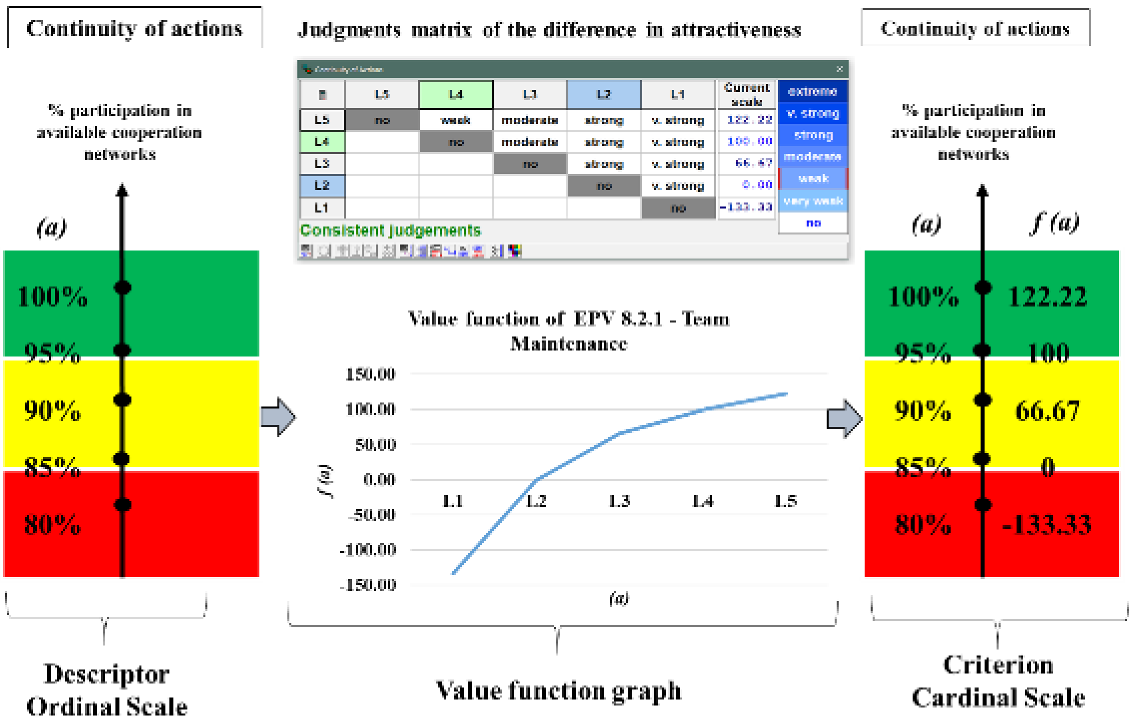

Supply team
Judgments matrix of the difference in attractiveness
Supply team
% of trained team with specific qualifications in the area
(a)
100%
90%
80%
70%
60%
Consistent judgements
Value function of EPV7.5.1 Supply team
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
L1
L2
L3
L4
L5
f (a)
(a)
122.22
100
66.67
0
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

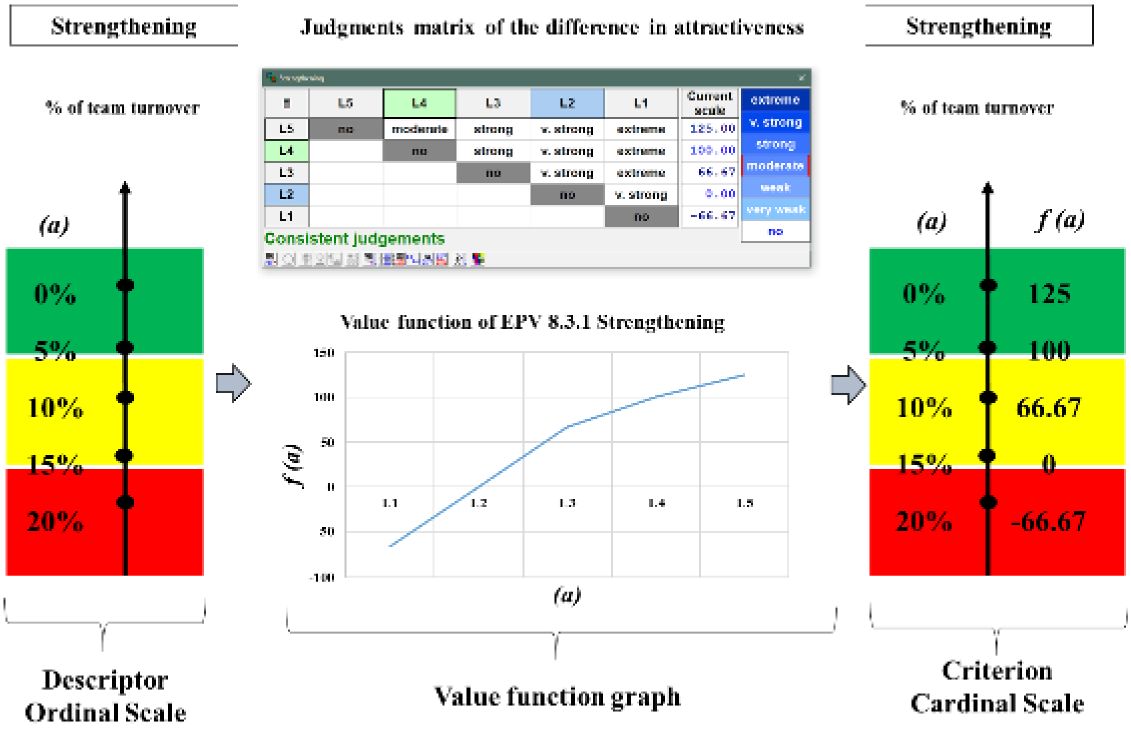

Planning
Judgments matrix of the difference in attractiveness
Planning
% of items purchased within the resupply deadline
(a)
100%
95%
90%
85%
80%
Consistent judgements
Value function of EPV 7.5.2 Planning
f (a)
a
125
100
66.67
0
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

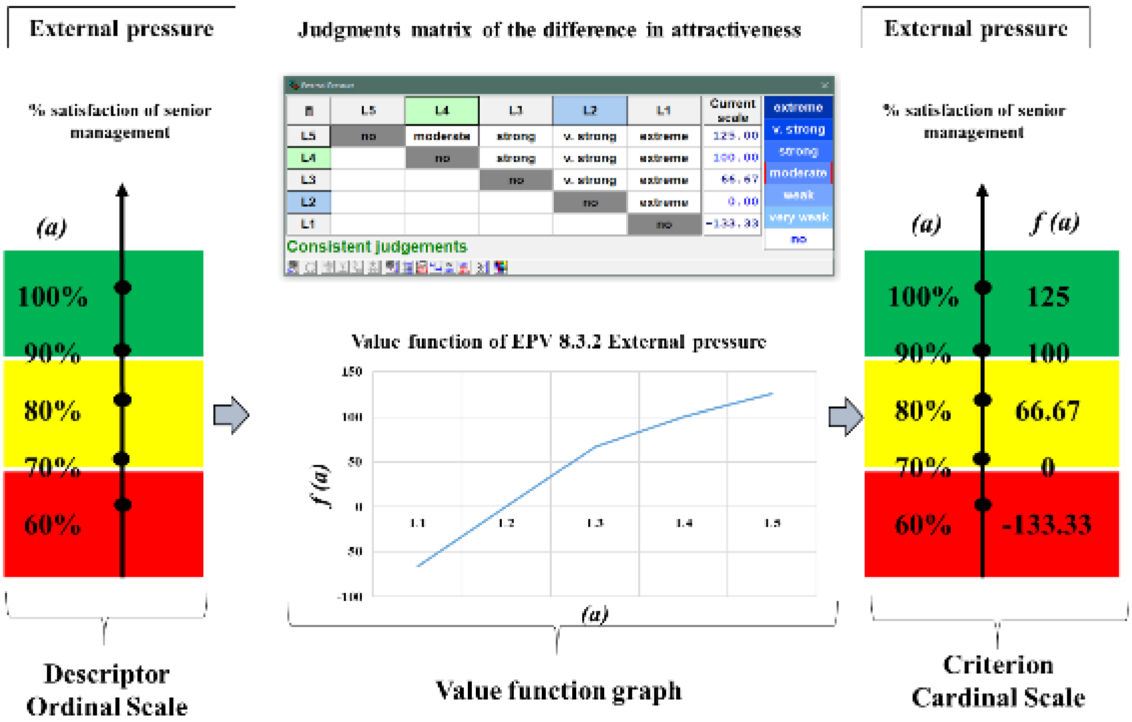

Best Practices
Judgments matrix of the difference in attractiveness
Best Practices
% dissemination of best practice
(a)
100%
95%
90%
85%
80%
L5
L4
L3
L2
L1
Current scale
no
very weak
weak
moderate
strong
116.67
100.00
66.67
0.00
-66.67
extreme
v. strong
Consistent judgements
Value function of EPV 8.1.1 - Best Practices in politics
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
(a)
% dissemination of best practice
(a)
f (a)
100%
116.67
95%
100
90%
66.67
85%
0
80%
-66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

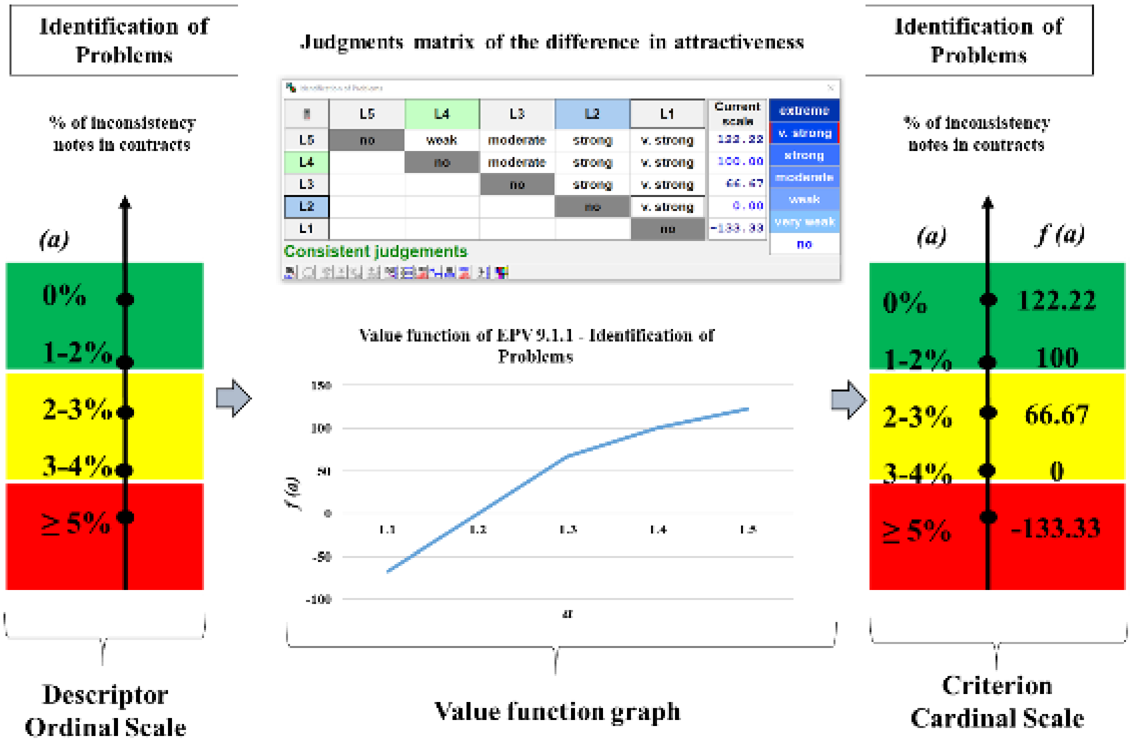

Networks
Judgments matrix of the difference in attractiveness
Networks
% participation in available cooperation networks
(a)
100%
90%
80%
70%
60%
L5
L4
L3
L2
L1
Current scale
no
weak
moderate
strong
v. strong
122.22
100.00
66.67
0.00
-133.33
extreme
very weak
Consistent judgements
Value function of EPV 8.1.2 - Networks
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
(a)
% participation in available cooperation networks
(a)
f (a)
100%
122.22
90%
100
80%
66.67
70%
0
60%
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

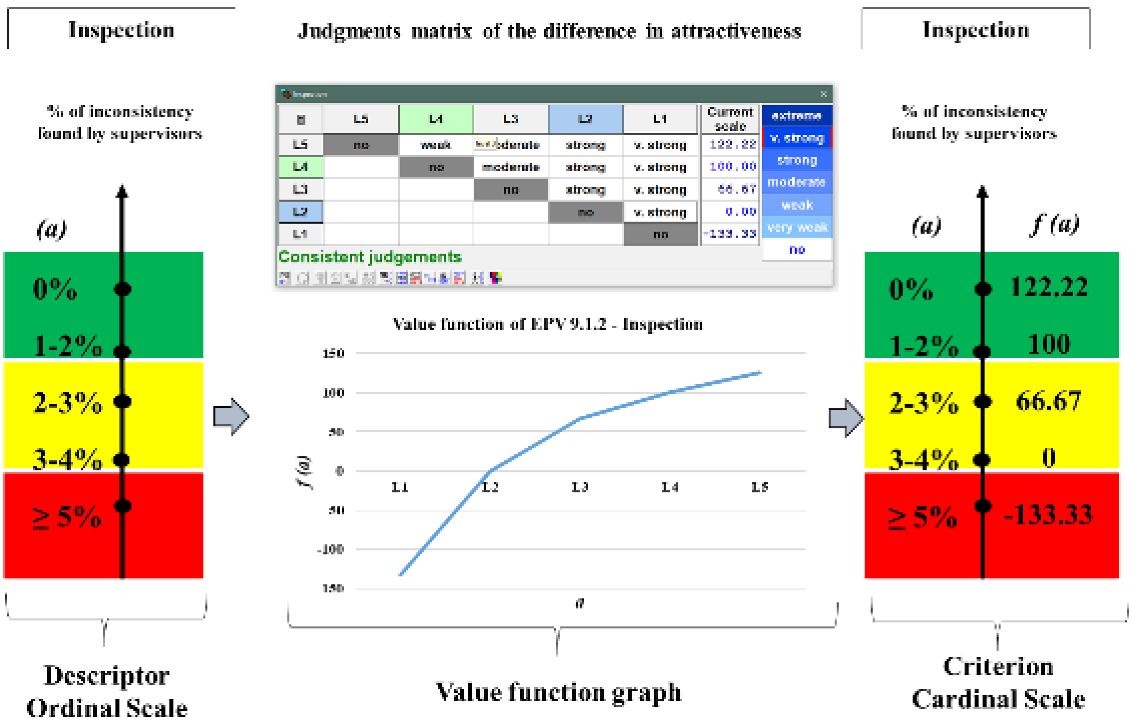

Team maintenance
Judgments matrix of the difference in attractiveness
Team maintenance
% Replacement of managers per year
(a)
Zero
5%
10%
15%
20%
Consistent judgements
Value function of EPV 8.2.1 - Team Maintenance
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
% Replacement of managers per year
(a)
f (a)
Zero
122.22
5%
100
10%
66.67
15%
0
20%
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

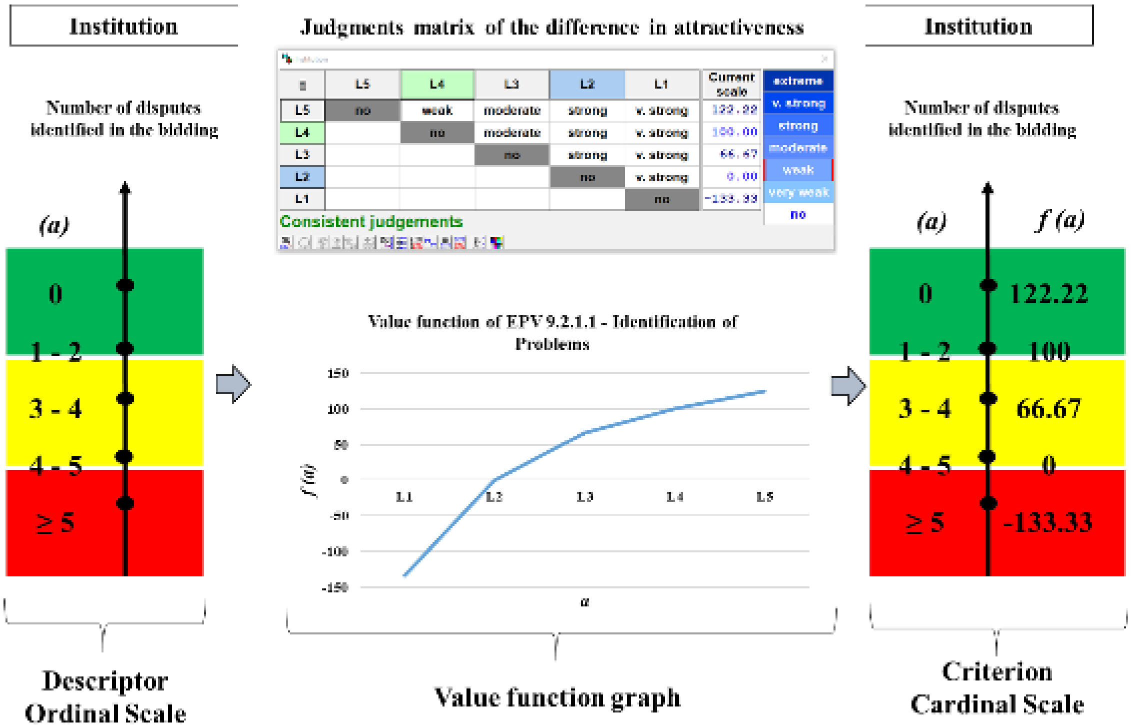

Continuity of actions
Judgments matrix of the difference in attractiveness
Continuity of actions
% participation in available cooperation networks
(a)
100%
95%
90%
85%
80%
Consistent judgements
Value function of EPV 8.2.1 - Team Maintenance
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
% participation in available cooperation networks
(a)
f (a)
100%
122.22
95%
100
90%
66.67
85%
0
80%
-133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Strengthening
Judgments matrix of the difference in attractiveness
Strengthening
% of team turnover
% of team turnover
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no v. strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
0%
5%
10%
15%
20%
Value function of EPV 8.3.1 Strengthening
f (a)
(a)
(a) f (a)
0% 125
5% 100
10% 66.67
15% 0
20% -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

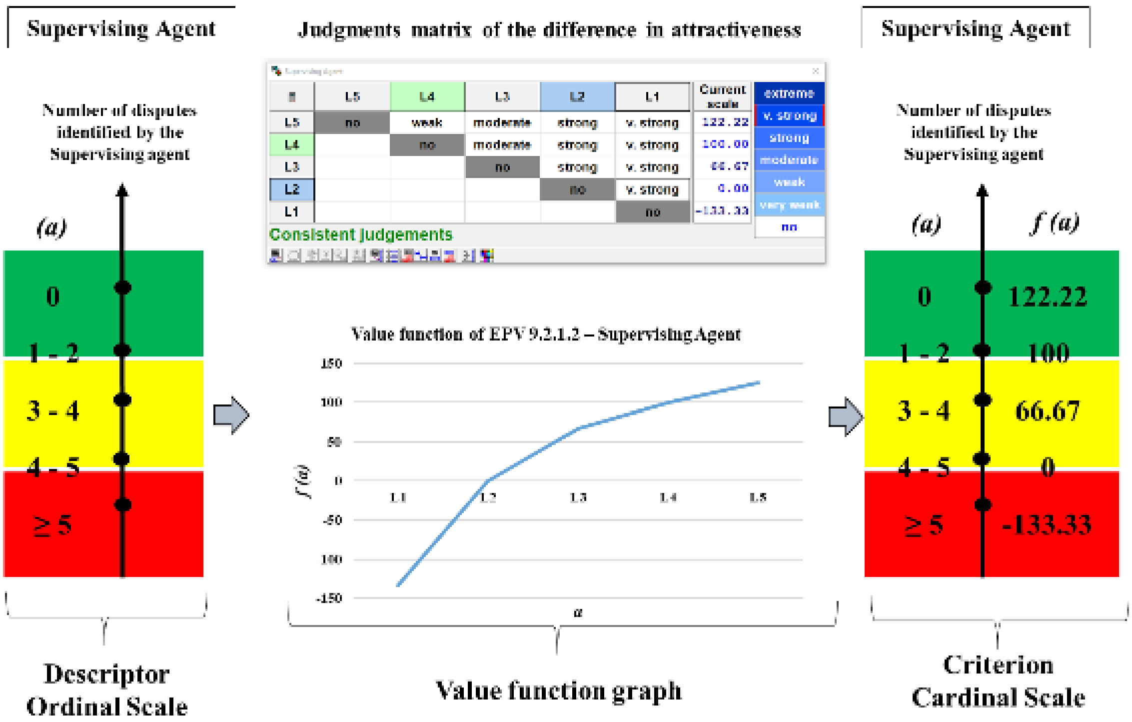

External pressure
Judgments matrix of the difference in attractiveness
External pressure
% satisfaction of senior management
% satisfaction of senior management
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
(a)
100%
90%
80%
70%
60%
Value function of EPV 8.3.2 External pressure
f (a)
(a)
(a) f (a)
100% 125
90% 100
80% 66.67
70% 0
60% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Identification of Problems
% of inconsistency notes in contracts
(a)
0%
1-2%
2-3%
3-4%
≥ 5%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.1.1 - Identification of Problems
150
100
50
0
-50
-100
f (a)
L1 L2 L3 L4 L5
a
Value function graph
Identification of Problems
% of inconsistency notes in contracts
(a) f (a)
0% 122.22
1-2% 100
2-3% 66.67
3-4% 0
≥ 5% -133.33
Criterion Cardinal Scale

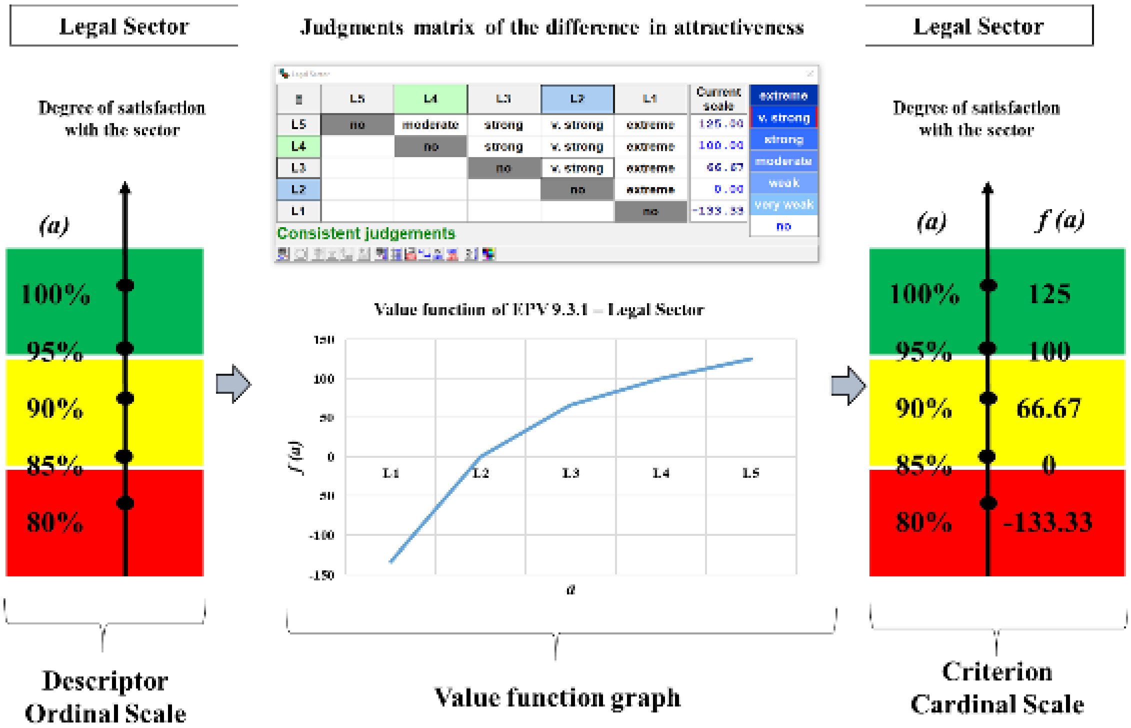

Inspection
% of inconsistency found by supervisors
(a)
0%
1-2%
2-3%
3-4%
≥ 5%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.1.2 - Inspection
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
a
Value function graph
Inspection
% of inconsistency found by supervisors
(a) f (a)
0% 122.22
1-2% 100
2-3% 66.67
3-4% 0
≥ 5% -133.33
Criterion Cardinal Scale

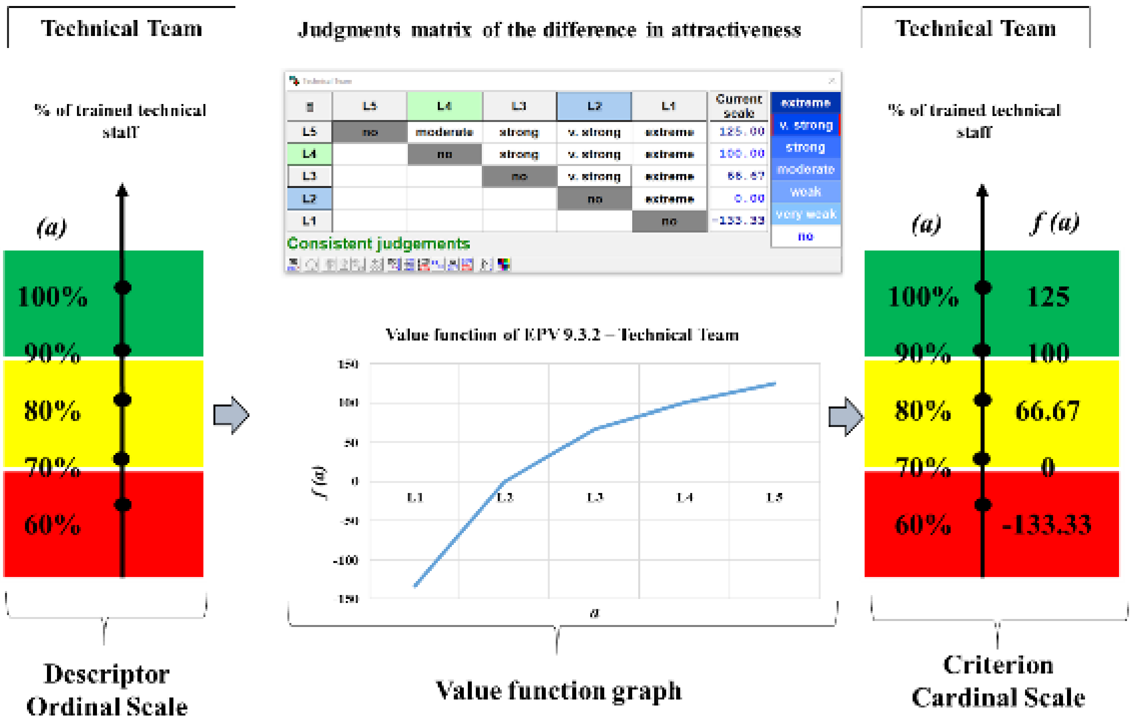


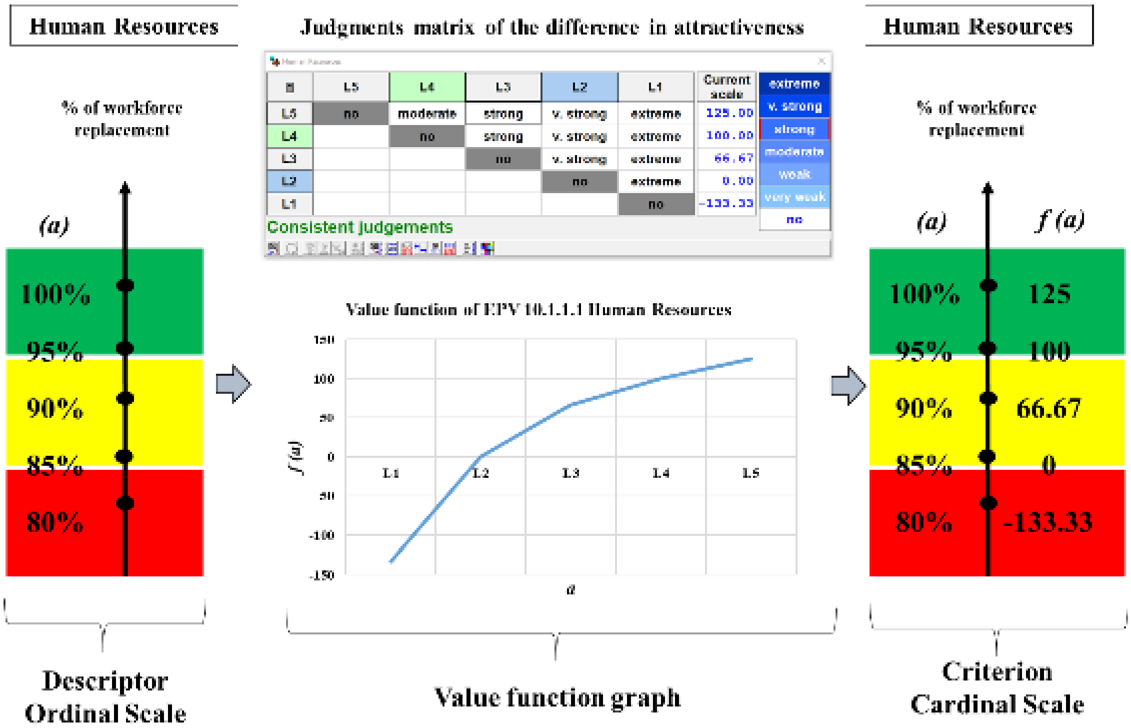
Institution
Number of disputes identified in the bidding
(a)
0
1 - 2
3 - 4
4 - 5
≥ 5
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.2.1.1 - Identification of Problems
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
a
Value function graph
Institution
Number of disputes identified in the bidding
(a)
f (a)
0
122.22
1 - 2
100
3 - 4
66.67
4 - 5
0
≥ 5
-133.33
Criterion Cardinal Scale

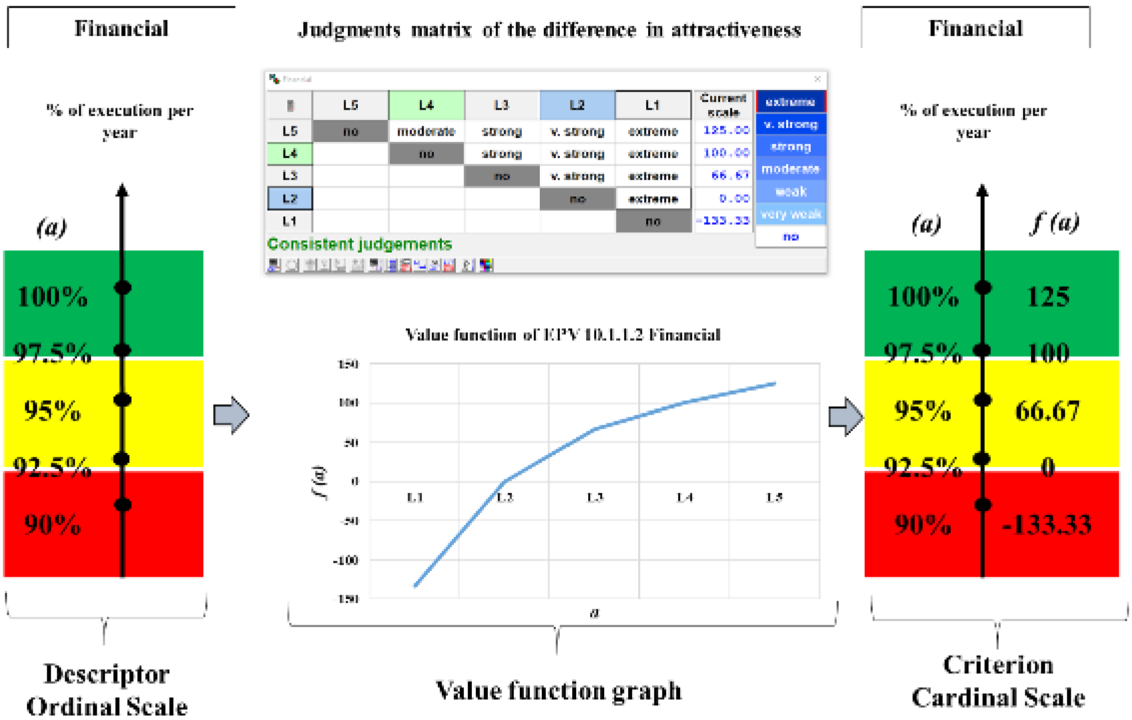


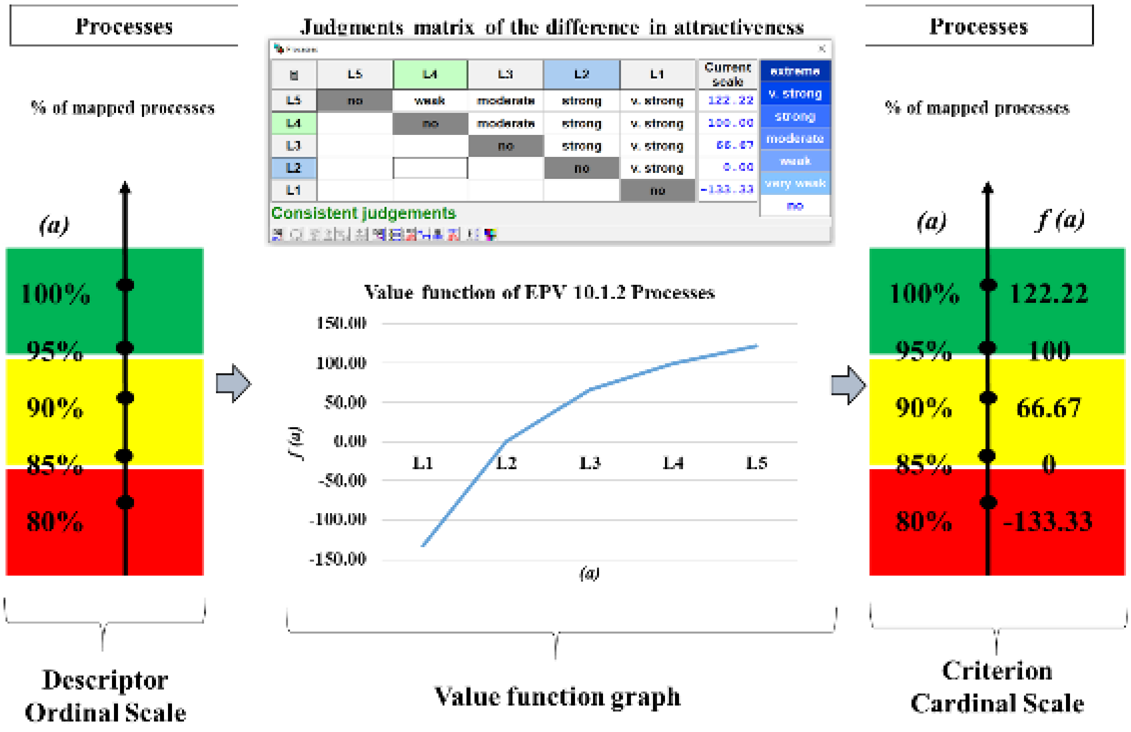
Supervising Agent
Number of disputes identified by the Supervising agent
(a)
0
1 - 2
3 - 4
4 - 5
≥ 5
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.2.1.2 – Supervising Agent
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
a
Value function graph
Supervising Agent
Number of disputes identified by the Supervising agent
(a)
f (a)
0
122.22
1 - 2
100
3 - 4
66.67
4 - 5
0
≥ 5
-133.33
Criterion Cardinal Scale

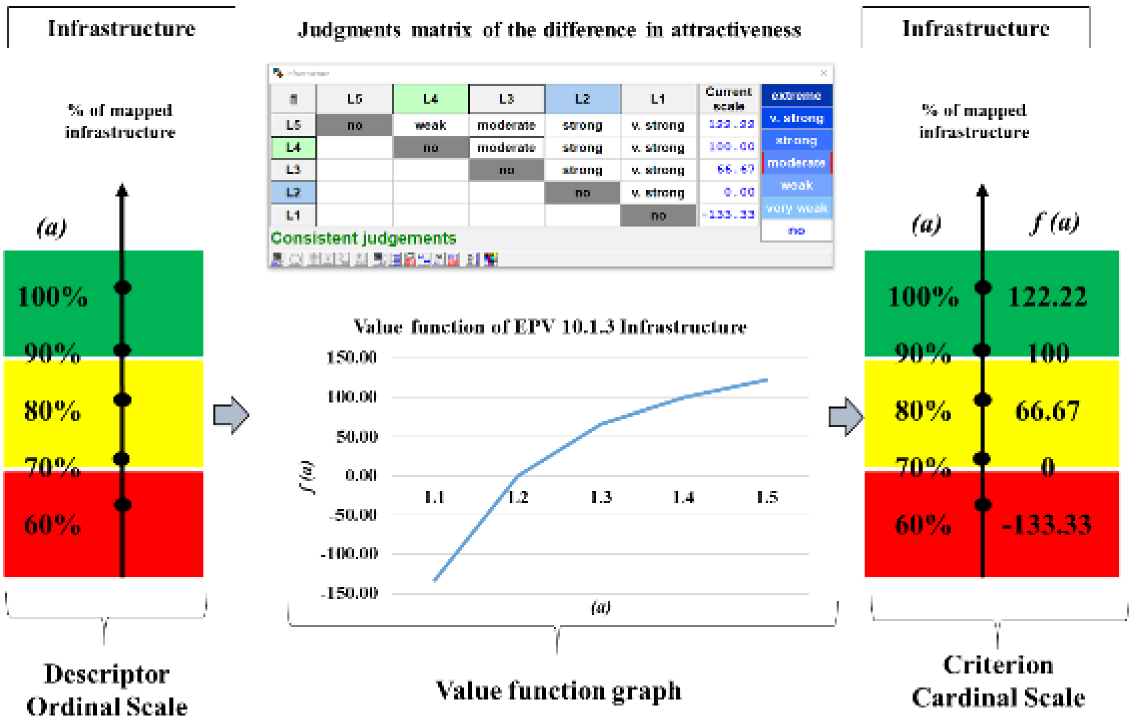

Legal Sector
Judgments matrix of the difference in attractiveness
Legal Sector
Degree of satisfaction with the sector
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.3.1 – Legal Sector
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
a
Degree of satisfaction with the sector
(a) f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

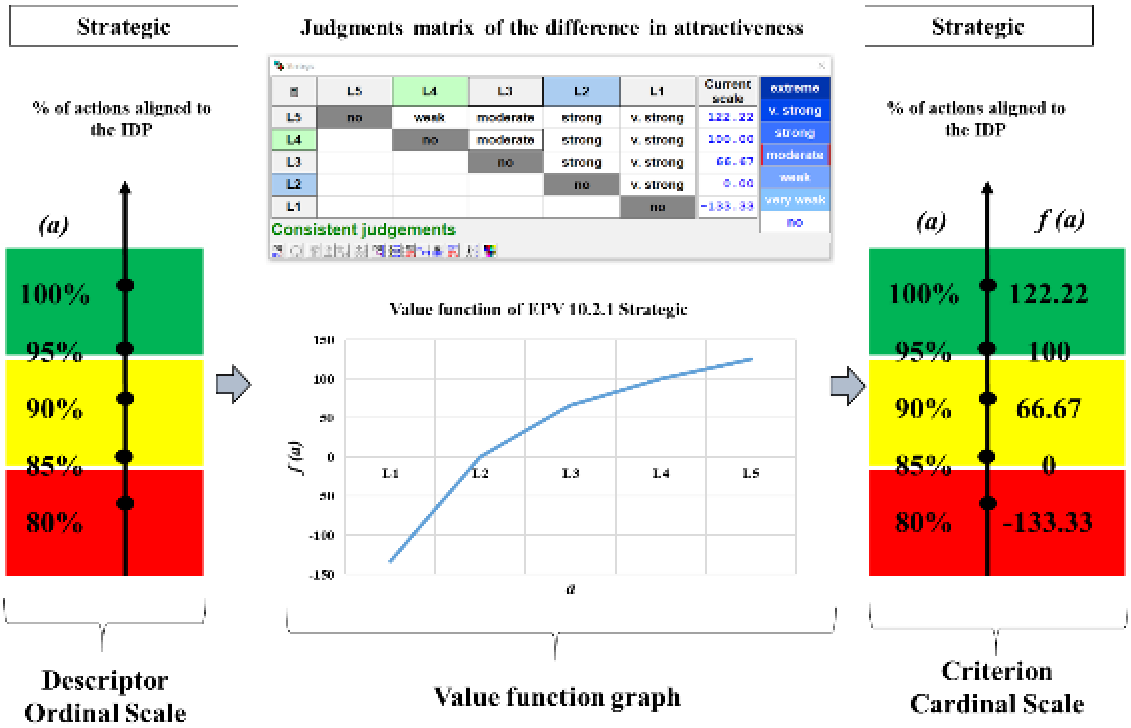

Technical Team
Judgments matrix of the difference in attractiveness
Technical Team
% of trained technical staff
(a)
100%
90%
80%
70%
60%
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 9.3.2 – Technical Team
150
100
50
0
-50
-100
-150
f (a)
L1 L2 L3 L4 L5
a
% of trained technical staff
(a) f (a)
100% 125
90% 100
80% 66.67
70% 0
60% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

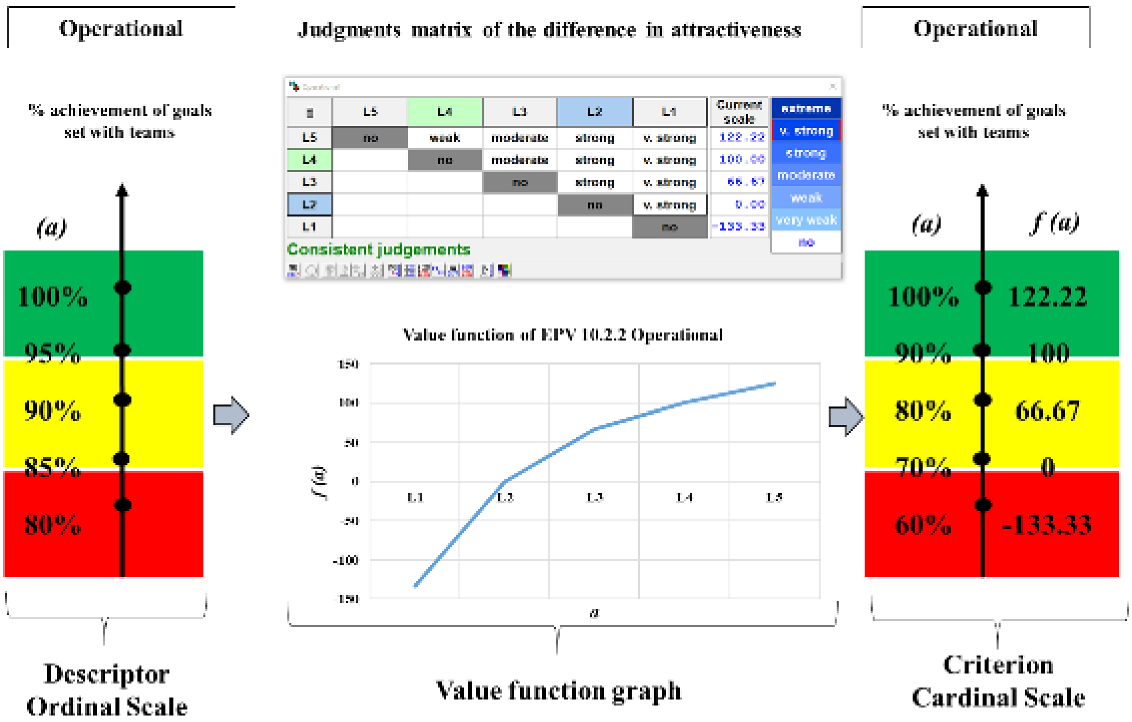

Human Resources
Judgments matrix of the difference in attractiveness
Human Resources
% of workforce replacement
% of workforce replacement
(a)
100%
95%
90%
85%
80%
Consistent judgements
Value function of EPV 10.1.1.1 Human Resources
(a) f (a)
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

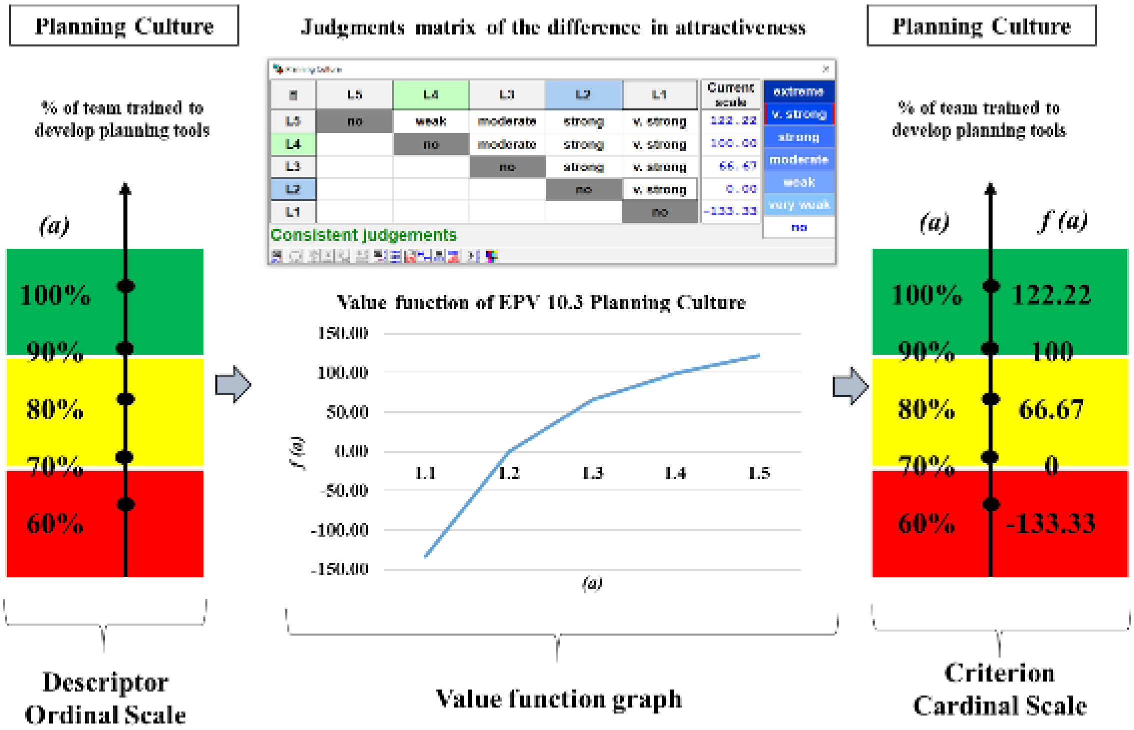

Financial
Judgments matrix of the difference in attractiveness
Financial
% of execution per year
% of execution per year
(a)
100%
97.5%
95%
92.5%
90%
Consistent judgements
Value function of EPV 10.1.1.2 Financial
(a) f (a)
100% 125
97.5% 100
95% 66.67
92.5% 0
90% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

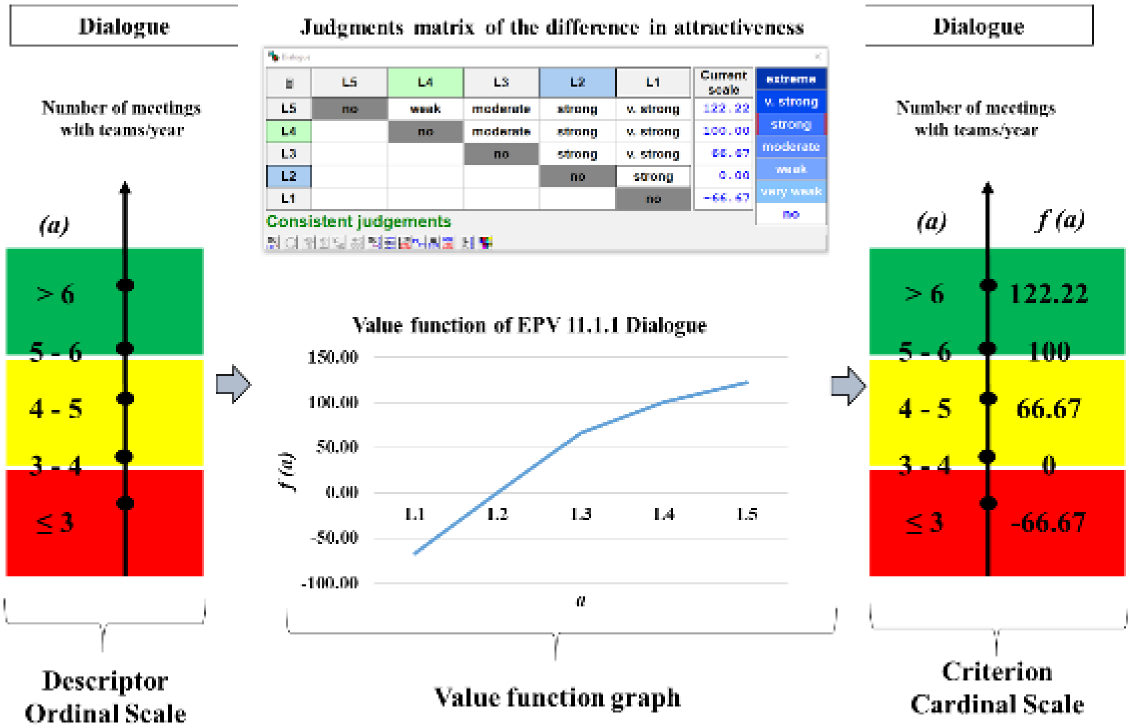

Processes
% of mapped processes
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
weak
moderate
strong
v. strong
122.22
100.00
66.67
0.00
-133.33
extreme
very weak
Consistent judgements
Value function of EPV 10.1.2 Processes
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
(a)
Value function graph
Processes
% of mapped processes
(a)
f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale


Infrastructure
% of mapped infrastructure
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
weak
moderate
strong
v. strong
122.22
100.00
66.67
0.00
-133.33
extreme
very weak
Consistent judgements
Value function of EPV 10.1.3 Infrastructure
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
(a)
Value function graph
Infrastructure
% of mapped infrastructure
(a)
f (a)
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Criterion Cardinal Scale

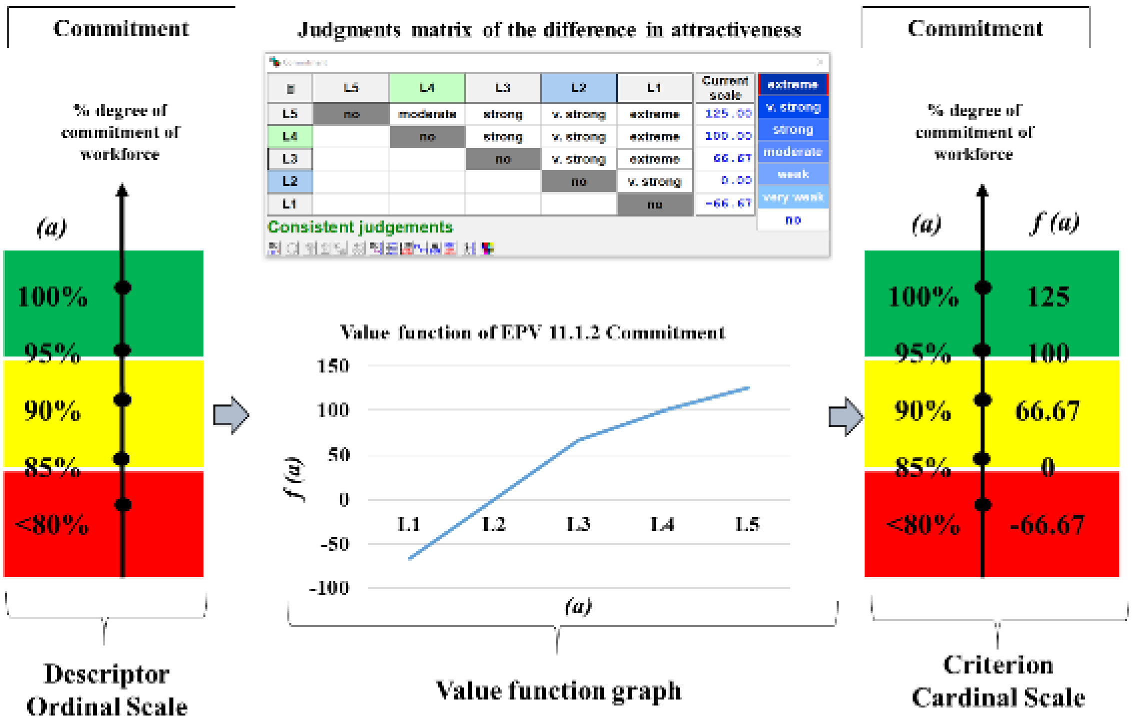

Strategic
Judgments matrix of the difference in attractiveness
Strategic
% of actions aligned to the IDP
% of actions aligned to the IDP
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 10.2.1 Strategic
f (a)
a
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Operational
Judgments matrix of the difference in attractiveness
Operational
% achievement of goals set with teams
% achievement of goals set with teams
(a)
100%
95%
90%
85%
80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 10.2.2 Operational
f (a)
a
(a) f (a)
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

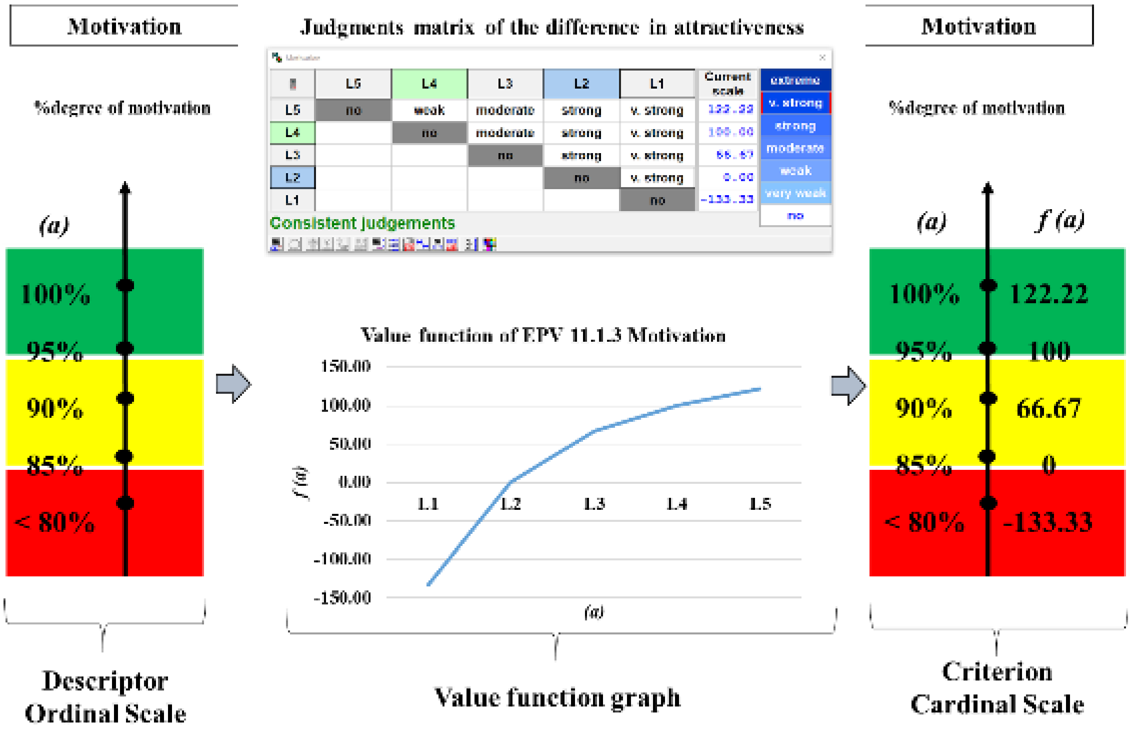

Planning Culture
% of team trained to develop planning tools
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
weak
moderate
strong
v. strong
122.22
100.00
66.67
0.00
-133.33
extreme
very weak
Consistent judgements
Value function of EPV 10.3 Planning Culture
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
1.1
1.2
1.3
1.4
1.5
f (a)
(a)
Value function graph
Planning Culture
% of team trained to develop planning tools
(a)
f (a)
100%
122.22
90%
100
80%
66.67
70%
0
60%
-133.33
Criterion Cardinal Scale

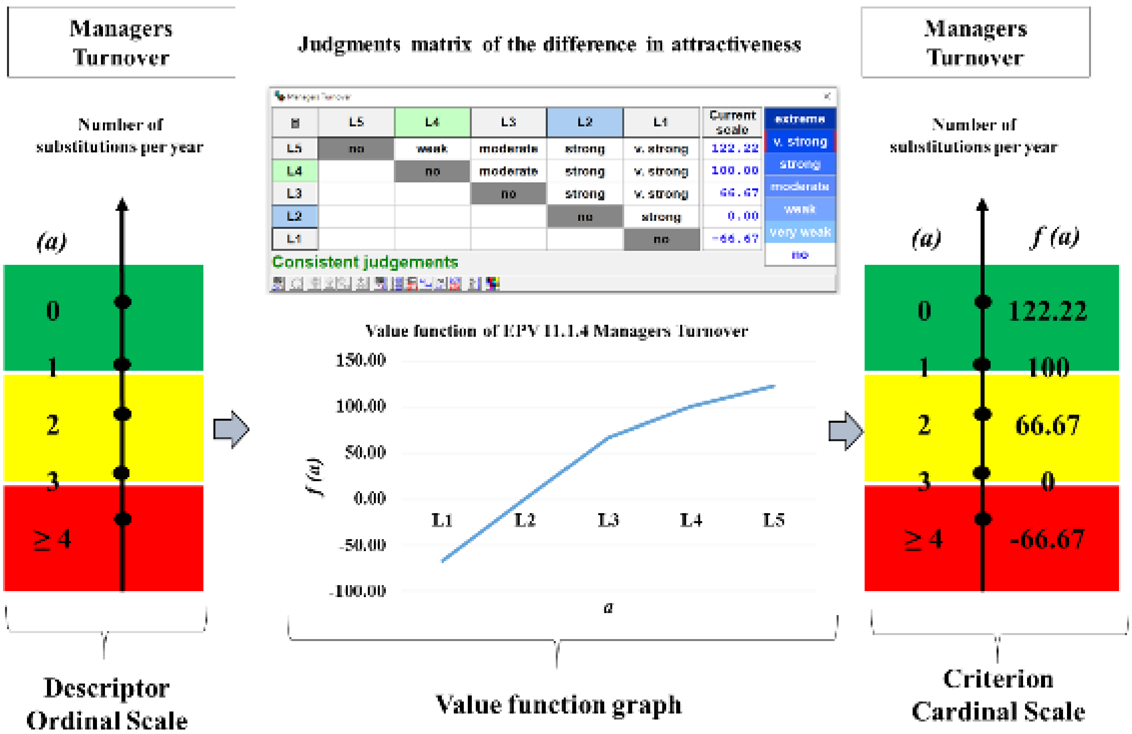


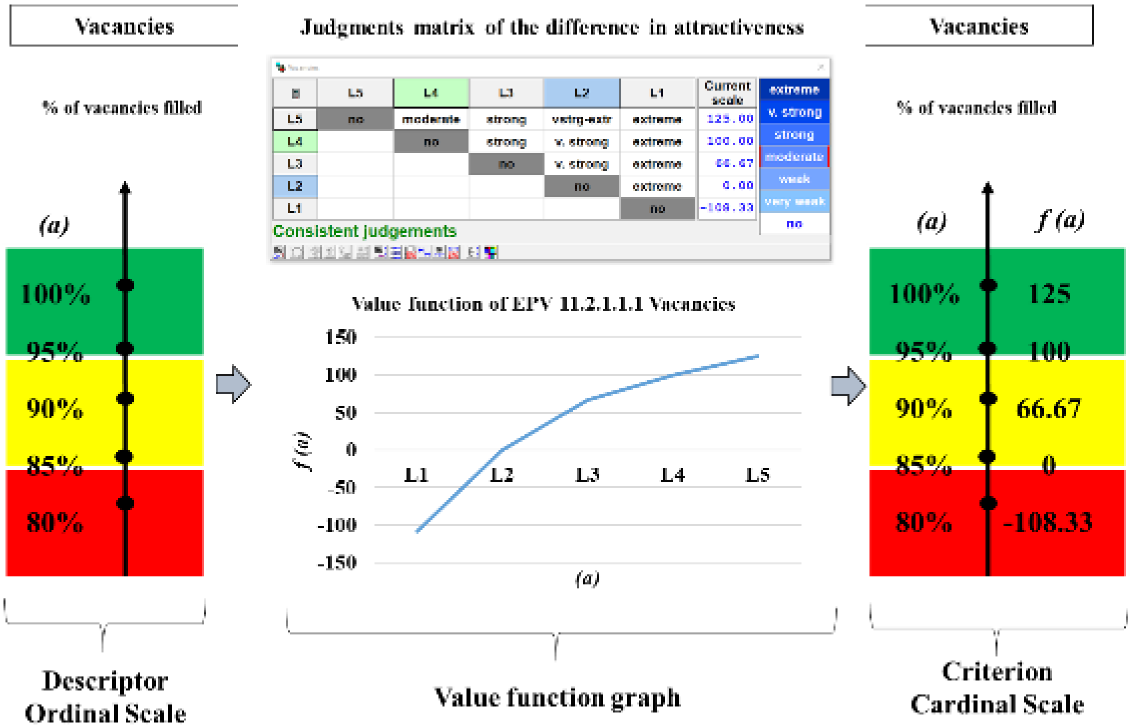
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	strong	0.00
L1					no	-66.67

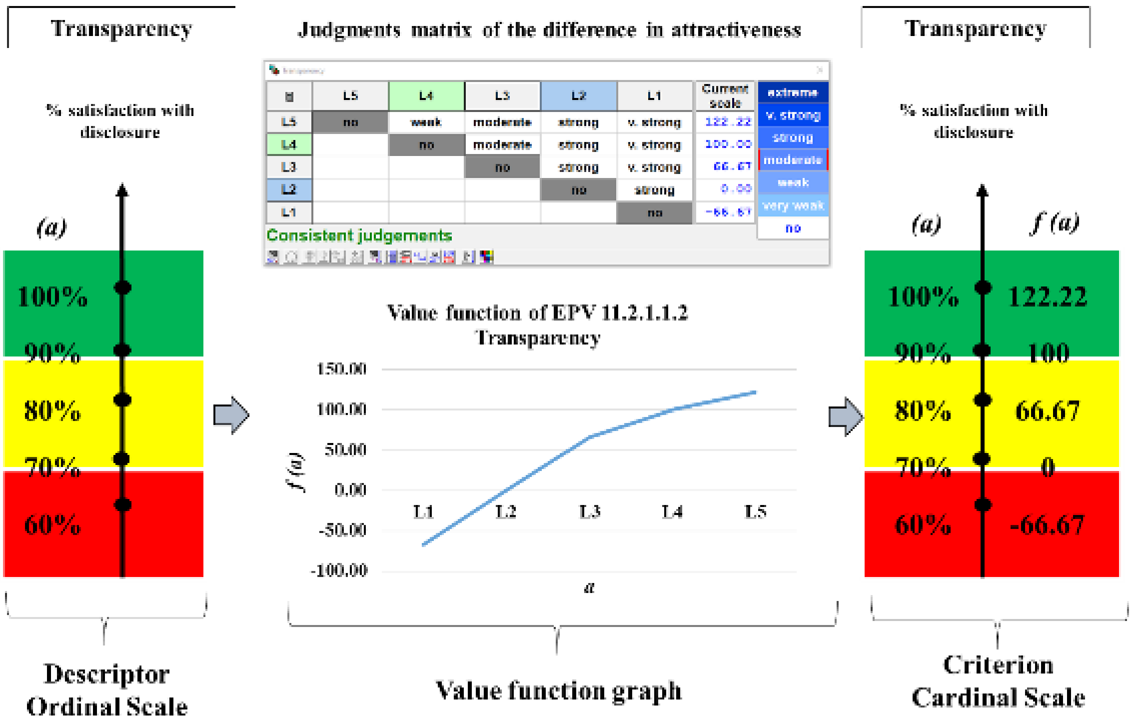


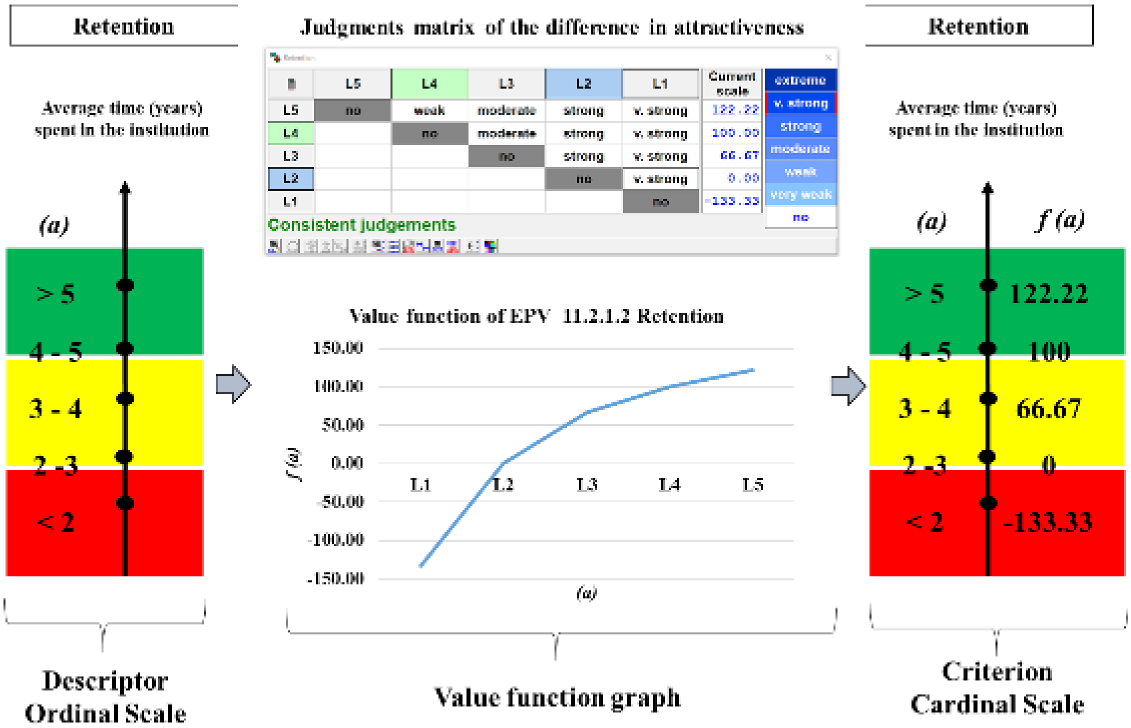
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	v. strong	0.00
L1					no	-66.67

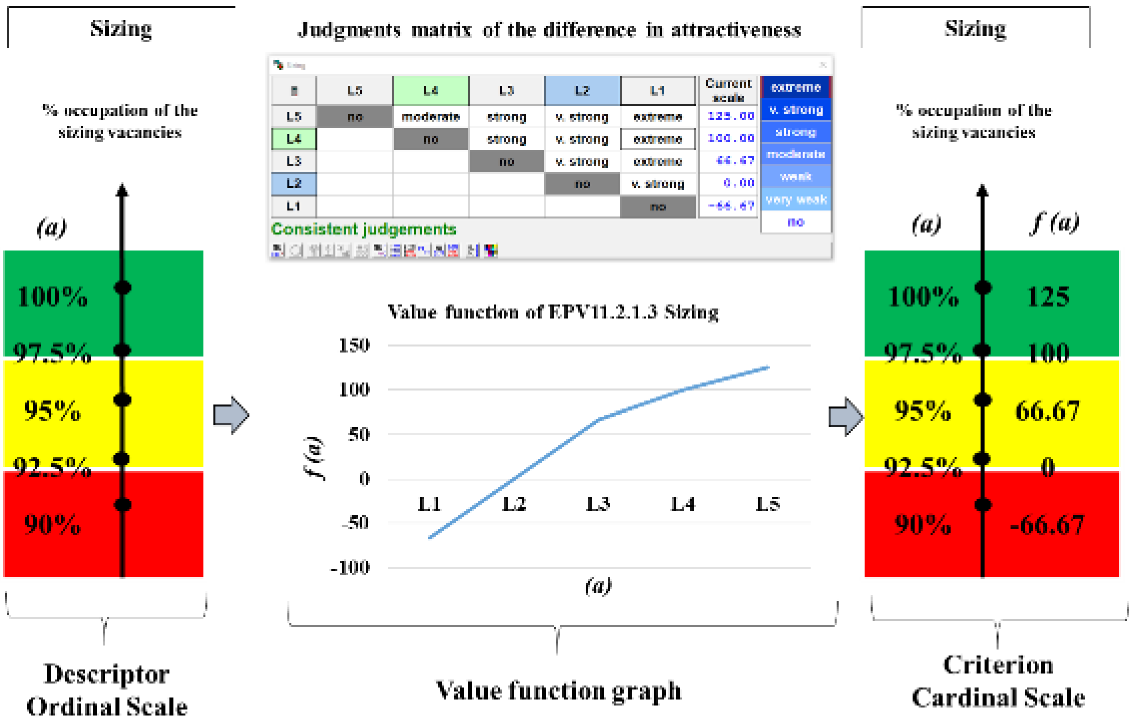

Motivation
Judgments matrix of the difference in attractiveness
Motivation
%degree of motivation
%degree of motivation
(a)
100%
95%
90%
85%
< 80%
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.1.3 Motivation
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
< 80% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

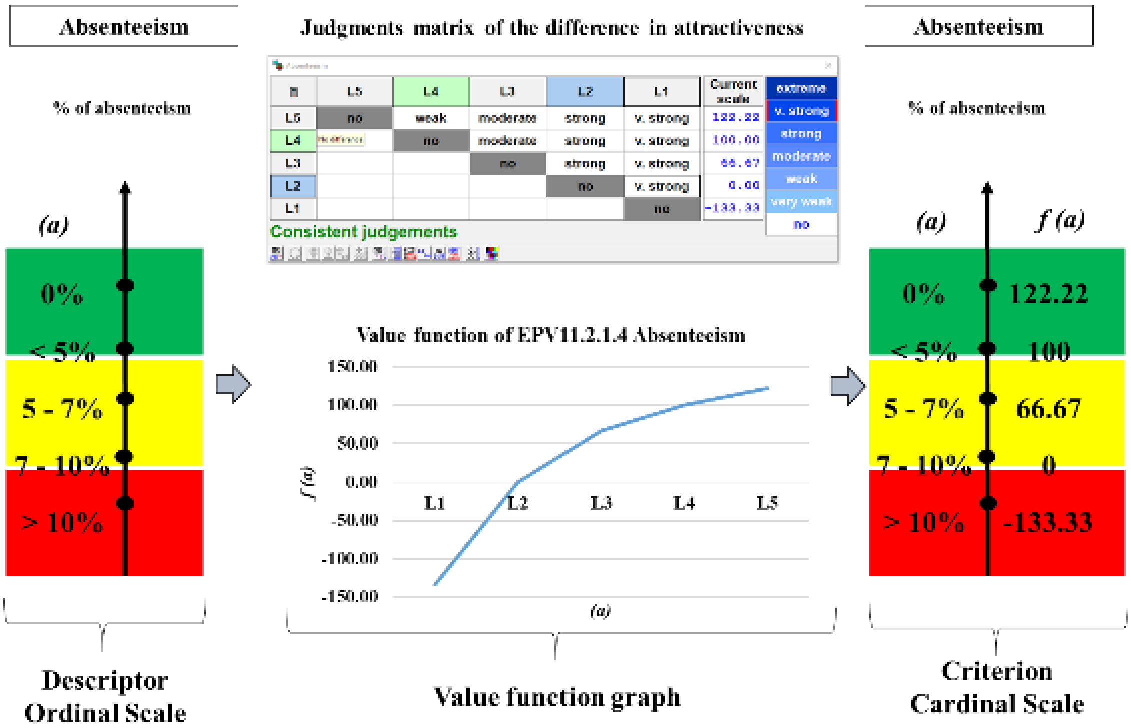

Managers Turnover
Judgments matrix of the difference in attractiveness
Managers Turnover
Number of substitutions per year
Number of substitutions per year
(a)
0
1
2
3
≥ 4
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.1.4 Managers Turnover
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
L1 L2 L3 L4 L5
a
(a) f (a)
0 122.22
1 100
2 66.67
3 0
≥ 4 -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

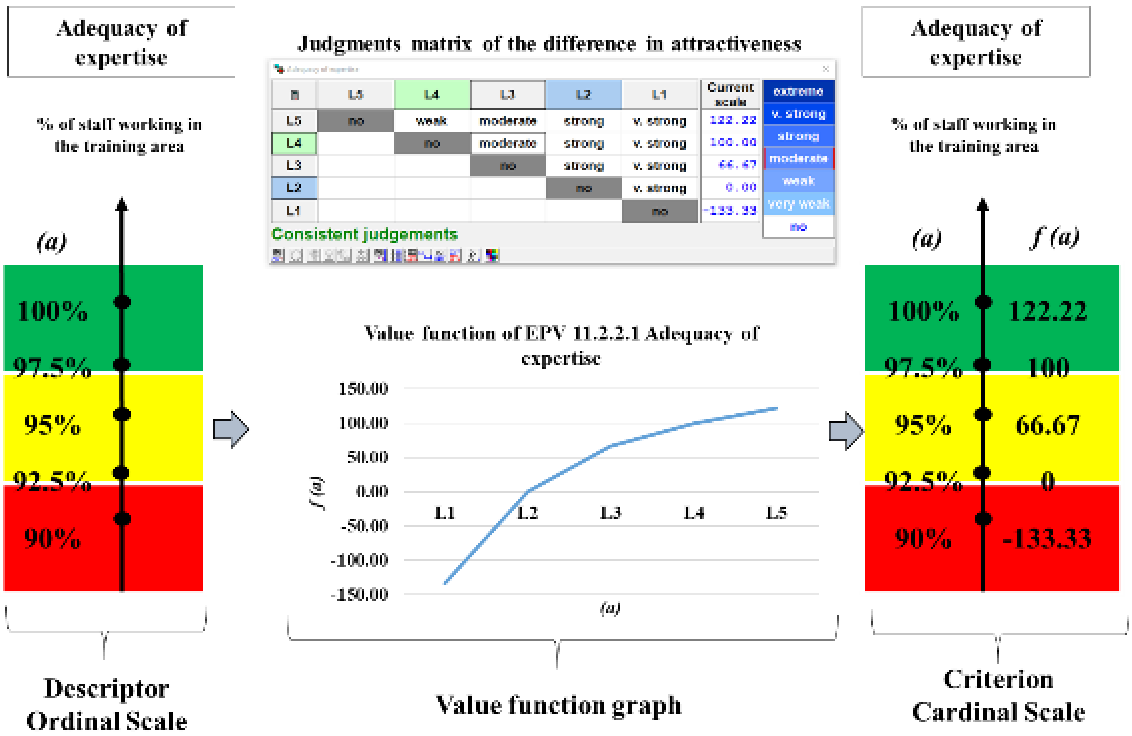

Vacancies
% of vacancies filled
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
moderate
strong
vstrg-extr
extreme
125.00
no
strong
v. strong
extreme
100.00
no
v. strong
extreme
66.67
no
extreme
0.00
no
-108.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.1.1.1 Vacancies
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
(a)
Value function graph
Vacancies
% of vacancies filled
(a)
f (a)
100%
125
95%
100
90%
66.67
85%
0
80%
-108.33
Criterion Cardinal Scale

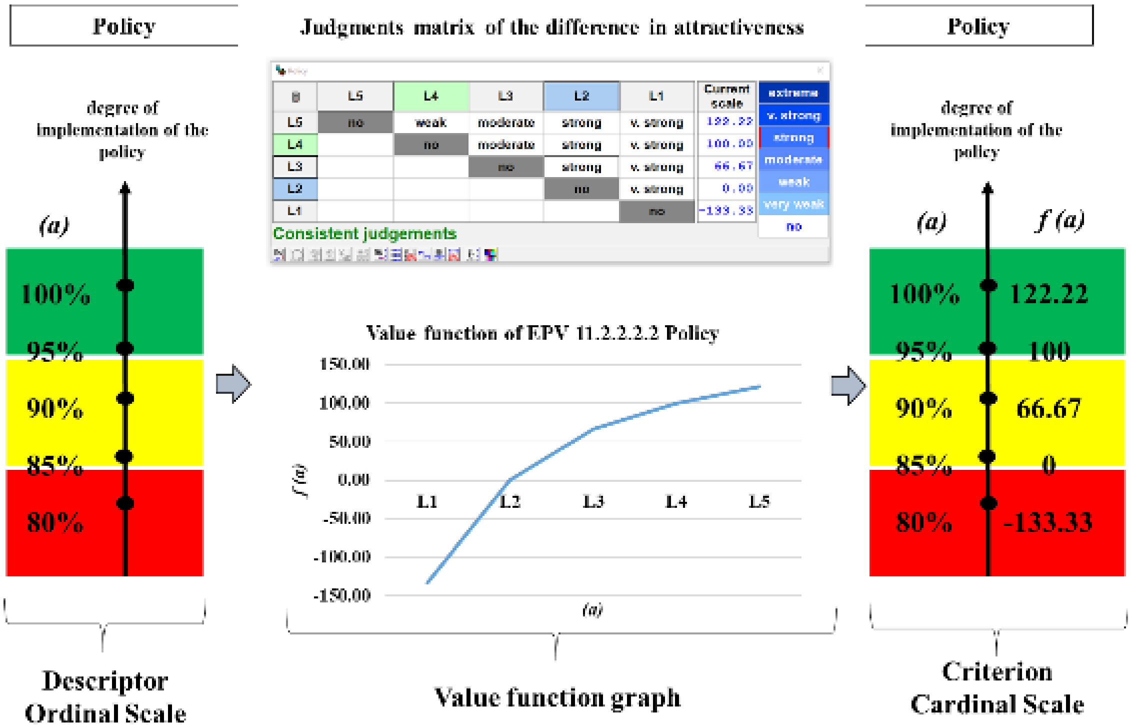

Transparency
% satisfaction with disclosure
(a)
100%
90%
80%
70%
60%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5
L4
L3
L2
L1
Current scale
no
weak
moderate
strong
v. strong
122.22
no
moderate
strong
v. strong
100.00
no
strong
v. strong
66.67
no
strong
0.00
no
-66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.1.1.2
Transparency
150.00
100.00
50.00
0.00
-50.00
-100.00
f (a)
L1
L2
L3
L4
L5
a
Value function graph
Transparency
% satisfaction with disclosure
(a)
f (a)
100%
122.22
90%
100
80%
66.67
70%
0
60%
-66.67
Criterion Cardinal Scale


Retention
Judgments matrix of the difference in attractiveness
Retention
Average time (years) spent in the institution
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Average time (years) spent in the institution
(a)
(a)
f (a)
> 5
4 - 5
3 - 4
2 -3
< 2
Value function of EPV 11.2.1.2 Retention
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
> 5 122.22
4 - 5 100
3 - 4 66.67
2 -3 0
< 2 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

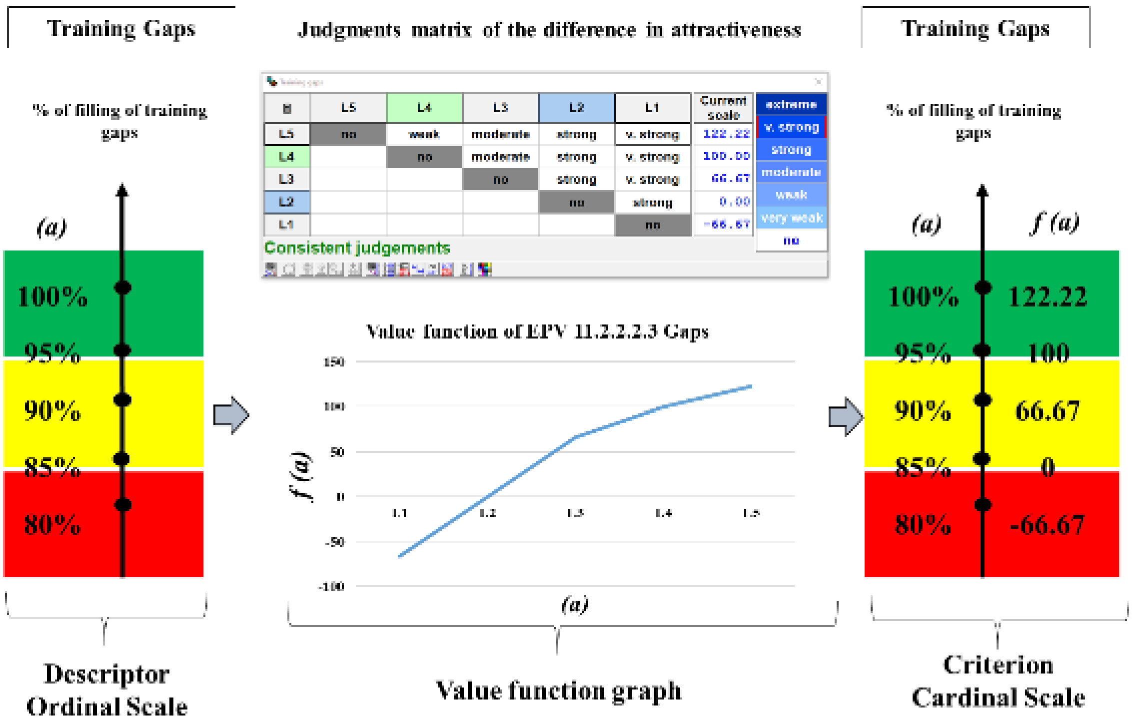

Sizing
Judgments matrix of the difference in attractiveness
Sizing
% occupation of the sizing vacancies
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no v. strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
% occupation of the sizing vacancies
(a)
(a)
f (a)
100%
97.5%
95%
92.5%
90%
Value function of EPV11.2.1.3 Sizing
150
100
50
0
-50
-100
f (a)
L1
L2
L3
L4
L5
(a)
100% 125
97.5% 100
95% 66.67
92.5% 0
90% -66.67
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale


Absenteeism
% of absenteeism
(a)
0%
< 5%
5 - 7%
7 - 10%
> 10%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV11.2.1.4 Absenteeism
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Absenteeism
% of absenteeism
(a) f (a)
0% 122.22
< 5% 100
5 - 7% 66.67
7 - 10% 0
> 10% -133.33
Criterion Cardinal Scale

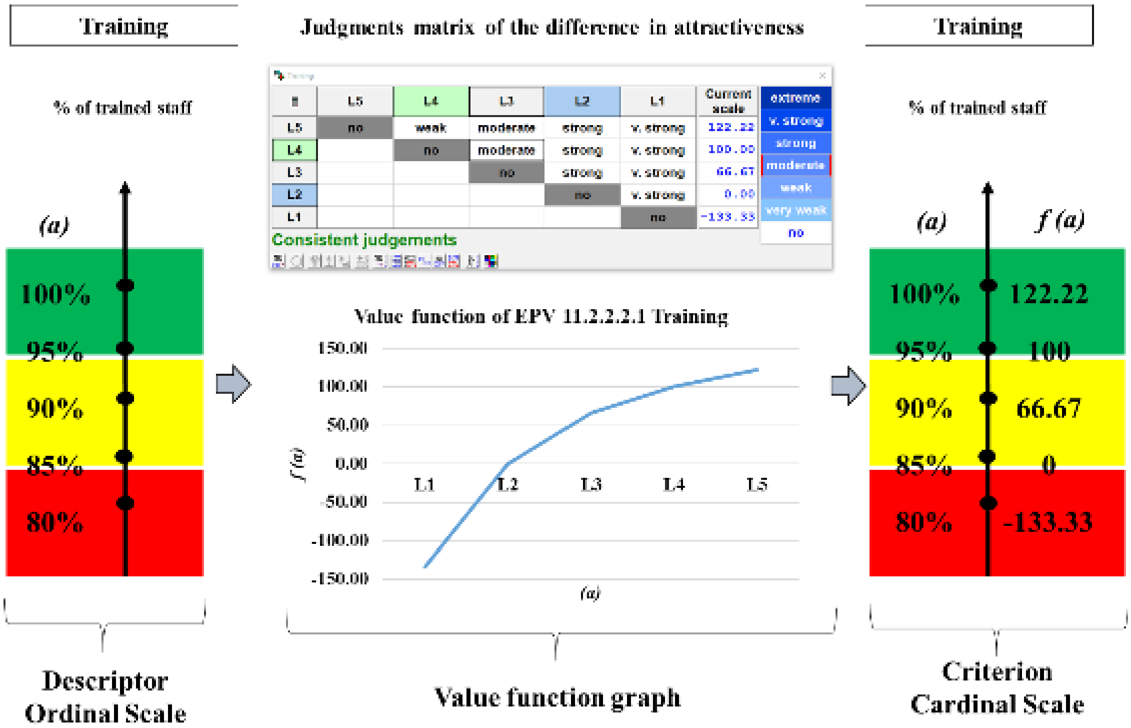

Adequacy of expertise
% of staff working in the training area
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.2.1 Adequacy of expertise
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Adequacy of expertise
% of staff working in the training area
(a) f (a)
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -133.33
Criterion Cardinal Scale

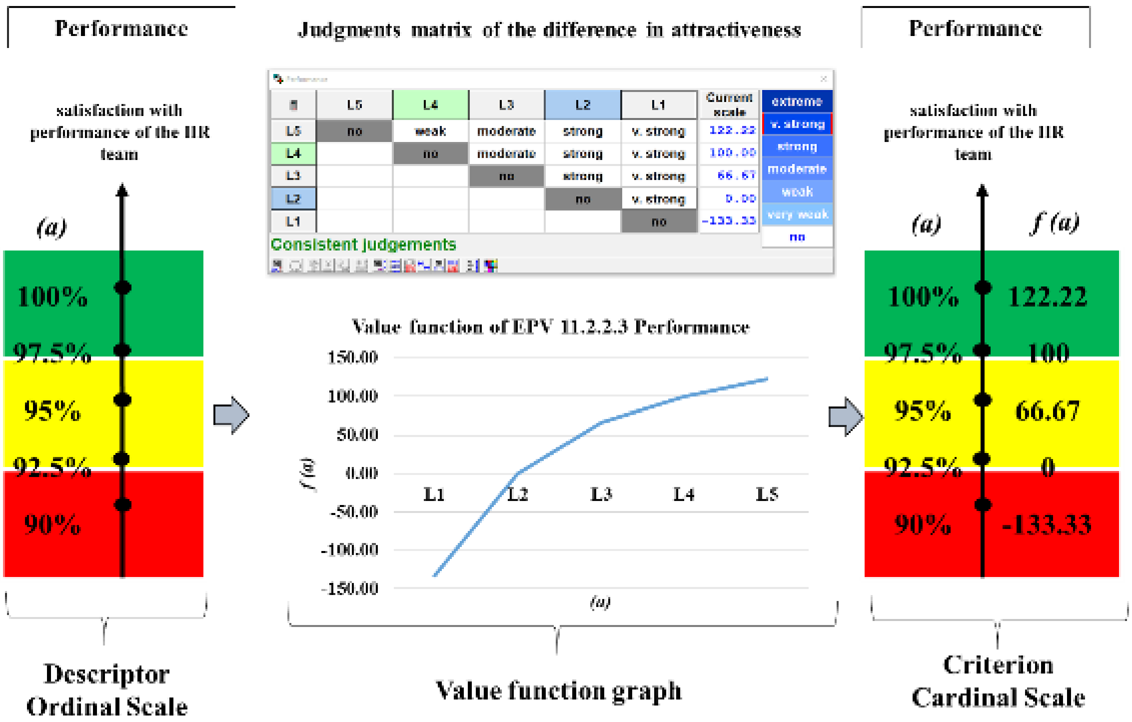


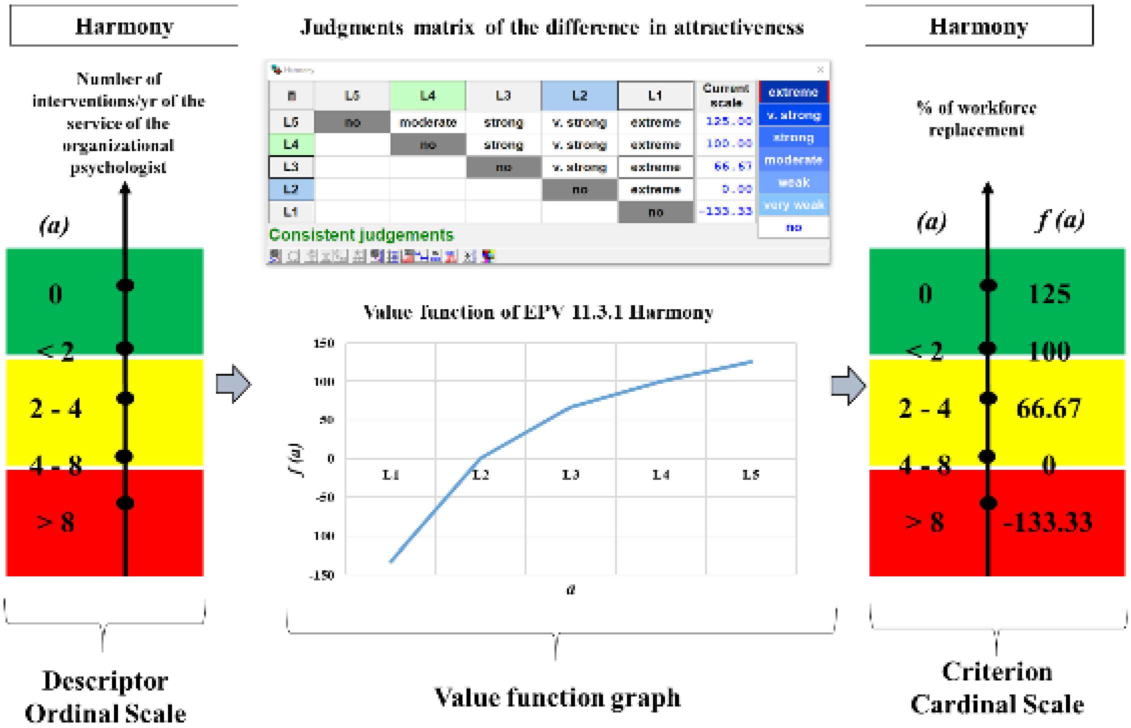
Policy
degree of implementation of the policy
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.2.2.2 Policy
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Policy
degree of implementation of the policy
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale



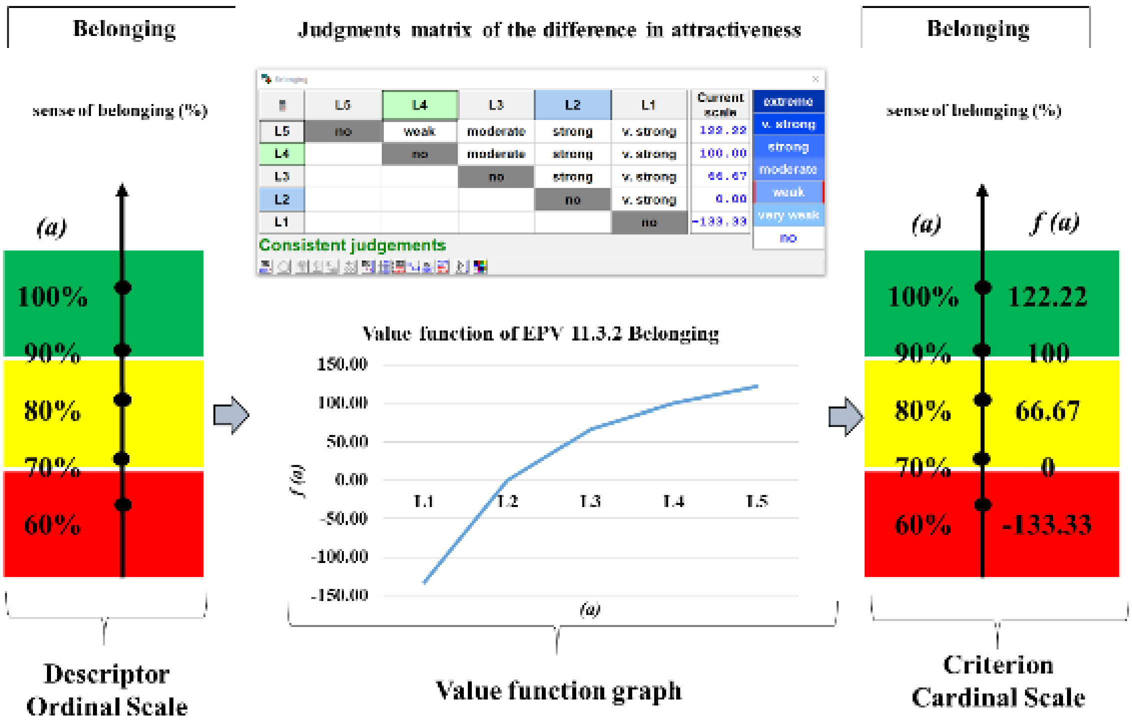
Training Gaps
% of filling of training gaps
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no strong 0.00
L1 no -66.67
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.2.2.3 Gaps
150
100
50
0
-50
-100
L1 L2 L3 L4 L5
f (a)
(a)
Value function graph
Training Gaps
% of filling of training gaps
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -66.67
Criterion Cardinal Scale


Training
% of trained staff
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.2.2.1 Training
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Training
% of trained staff
(a) f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale

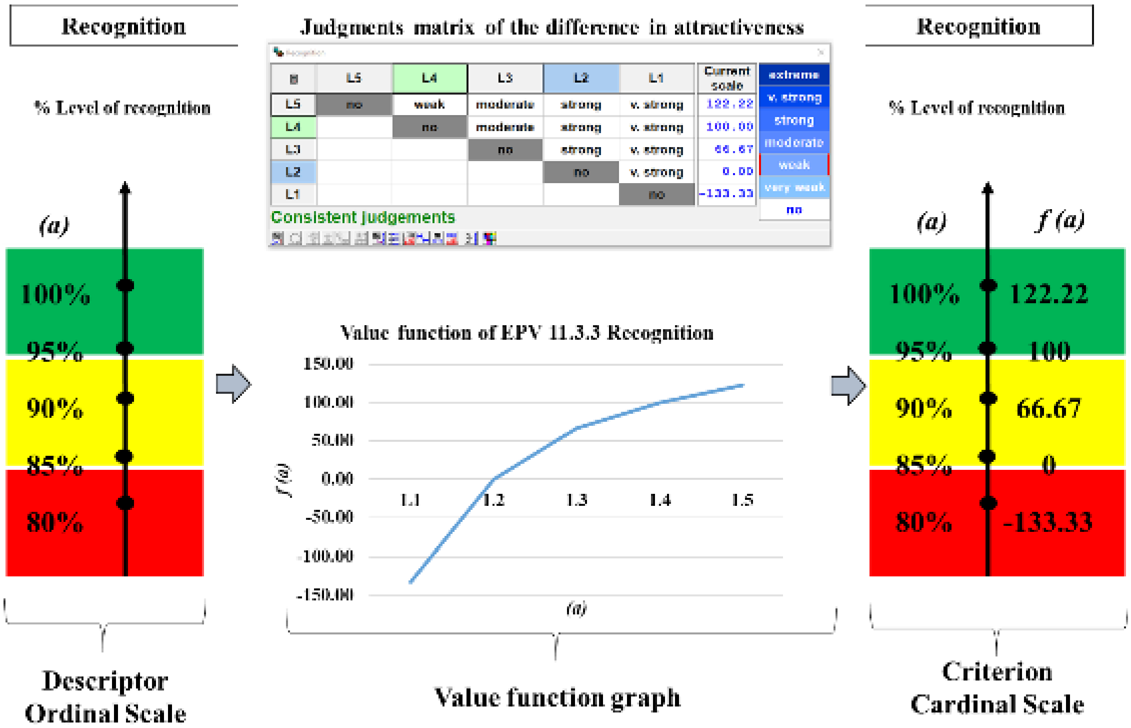

Performance
satisfaction with performance of the HR team
(a)
100%
97.5%
95%
92.5%
90%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.2.2.3 Performance
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
Value function graph
Performance
satisfaction with performance of the HR team
(a) f (a)
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -133.33
Criterion Cardinal Scale



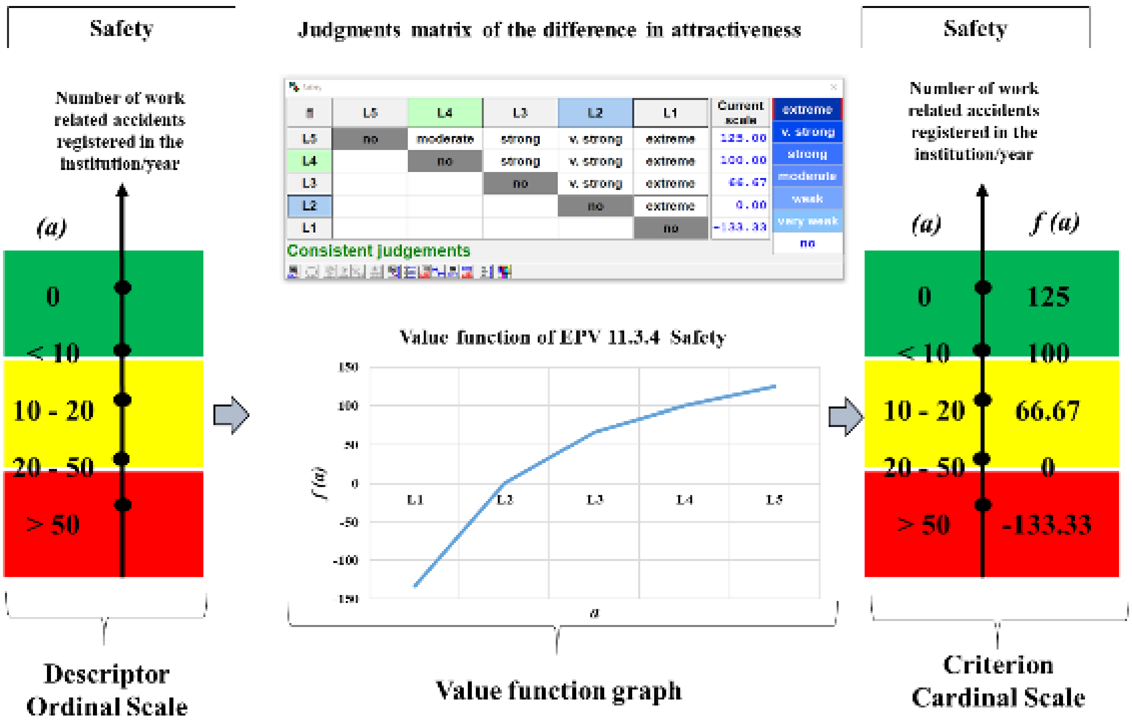
	L5	L4	L3	L2	L1	Current scale
L5	no	moderate	strong	v. strong	extreme	125.00
L4		no	strong	v. strong	extreme	100.00
L3			no	v. strong	extreme	66.67
L2				no	extreme	0.00
L1					no	-133.33



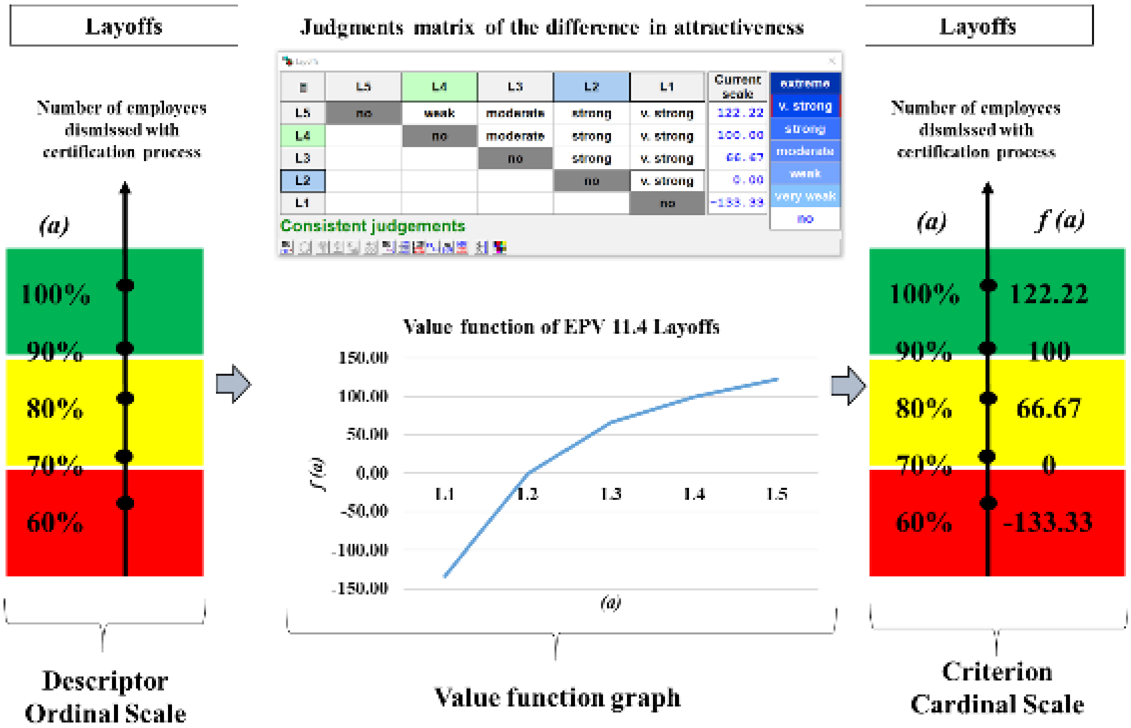
	L5	L4	L3	L2	L1	Current scale
L5	no	weak	moderate	strong	v. strong	122.22
L4		no	moderate	strong	v. strong	100.00
L3			no	strong	v. strong	66.67
L2				no	v. strong	0.00
L1					no	-133.33



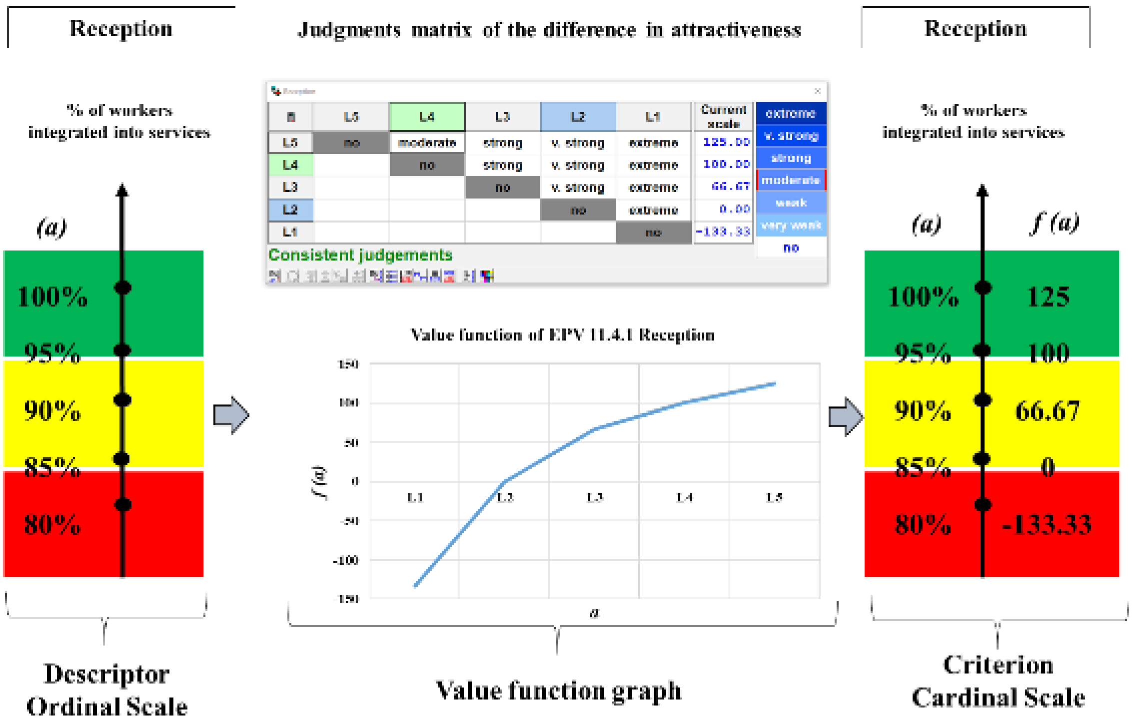
Recognition
% Level of recognition
(a)
100%
95%
90%
85%
80%
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.3.3 Recognition
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1
L2
L3
L4
L5
(a)
Value function graph
Recognition
% Level of recognition
(a)
f (a)
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
Criterion Cardinal Scale



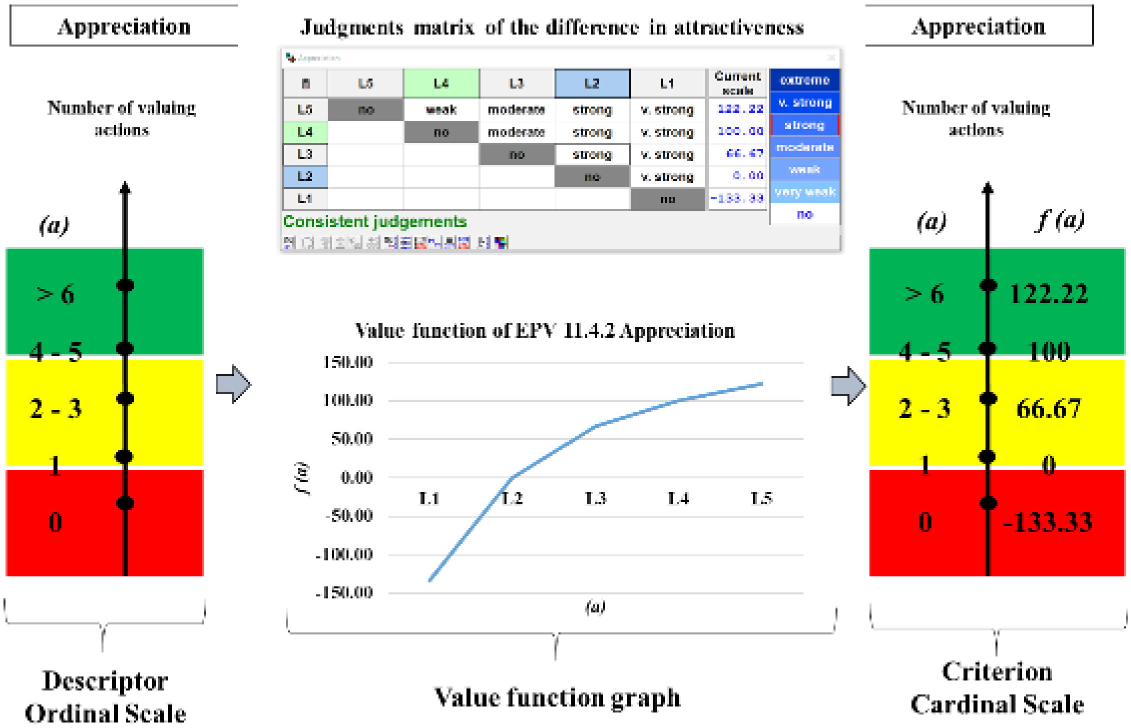
Safety
Number of work related accidents registered in the institution/year
(a)
0
< 10
10 - 20
20 - 50
> 50
Descriptor Ordinal Scale
Judgments matrix of the difference in attractiveness
L5 L4 L3 L2 L1 Current scale
L5 no moderate strong v. strong extreme 125.00
L4 no strong v. strong extreme 100.00
L3 no v. strong extreme 66.67
L2 no extreme 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Value function of EPV 11.3.4 Safety
150
100
50
0
-50
-100
-150
f (a)
L1
L2
L3
L4
L5
a
Value function graph
Safety
Number of work related accidents registered in the institution/year
(a)
f (a)
0 125
< 10 100
10 - 20 66.67
20 - 50 0
> 50 -133.33
Criterion Cardinal Scale

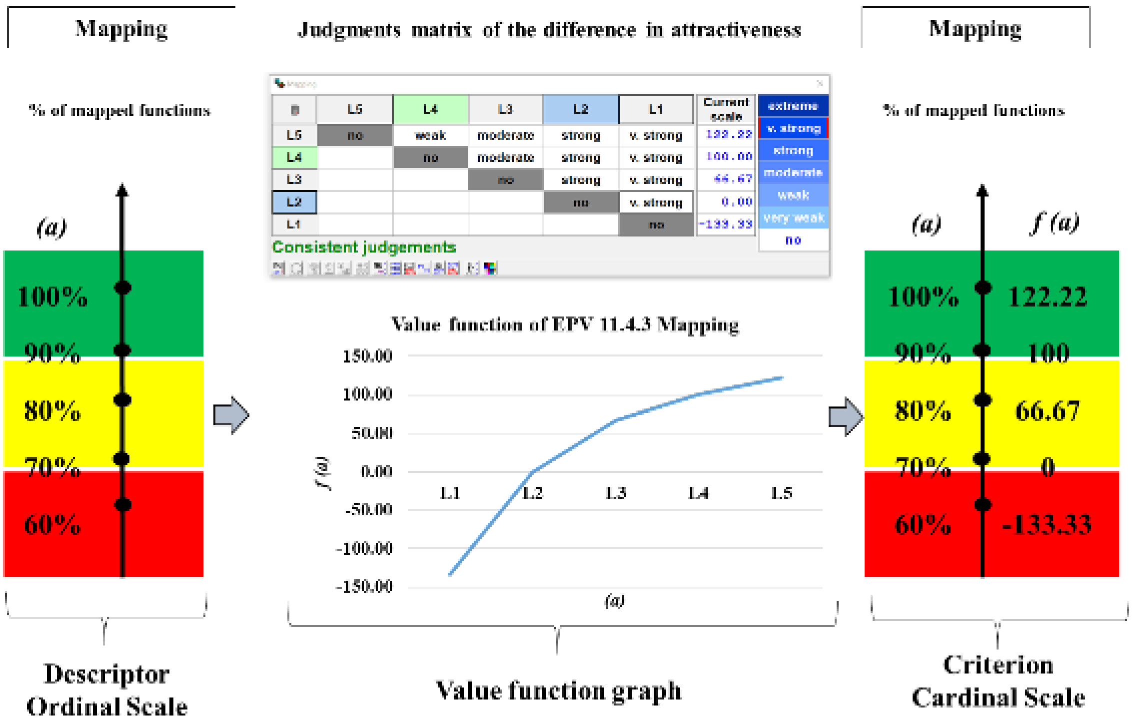


	L5	L4	L3	L2	L1	Current scale	
L5	no	weak	moderate	strong	v. strong	122.22	extreme
L4		no	moderate	strong	v. strong	100.00	v. strong
L3			no	strong	v. strong	66.67	strong
L2				no	v. strong	0.00	moderate
L1					no	-133.33	weak
							very weak
							no

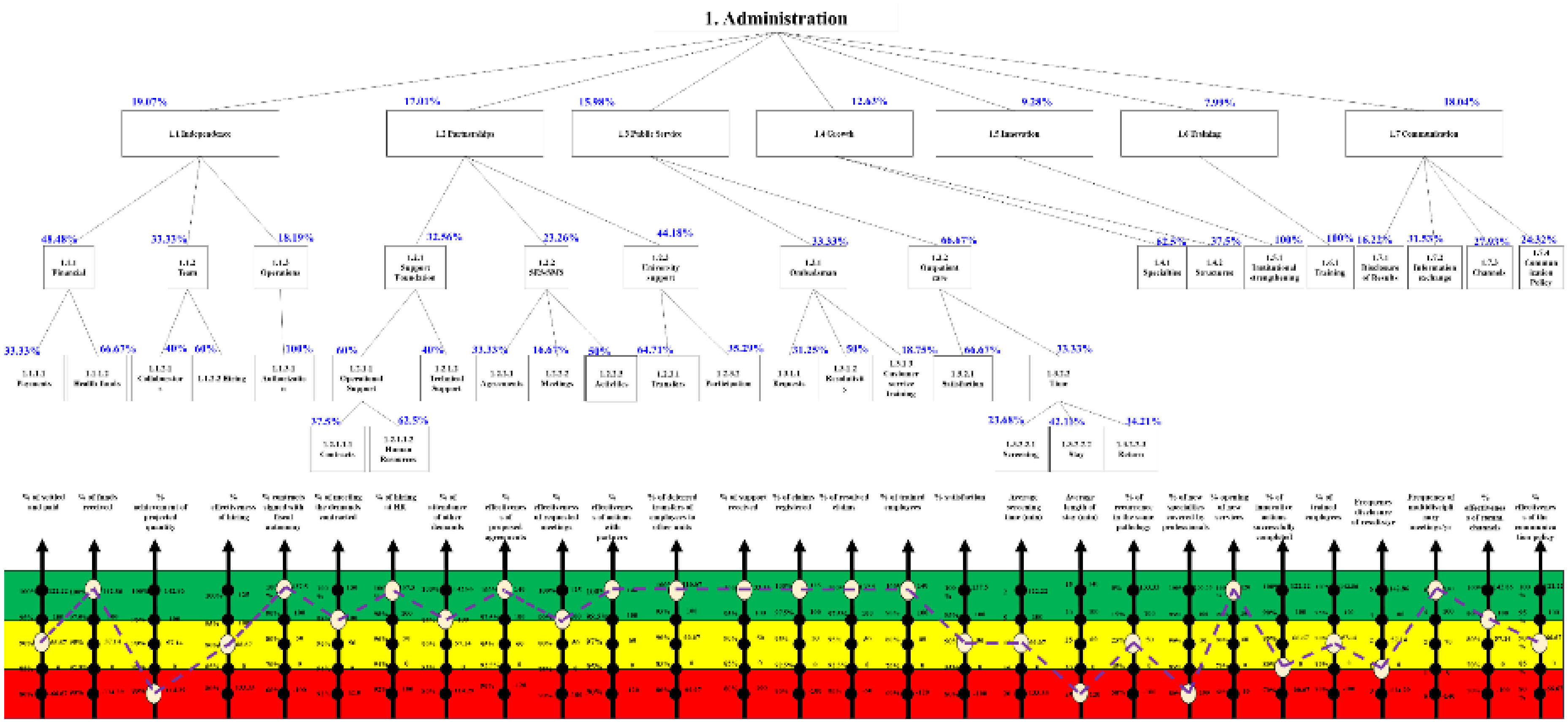


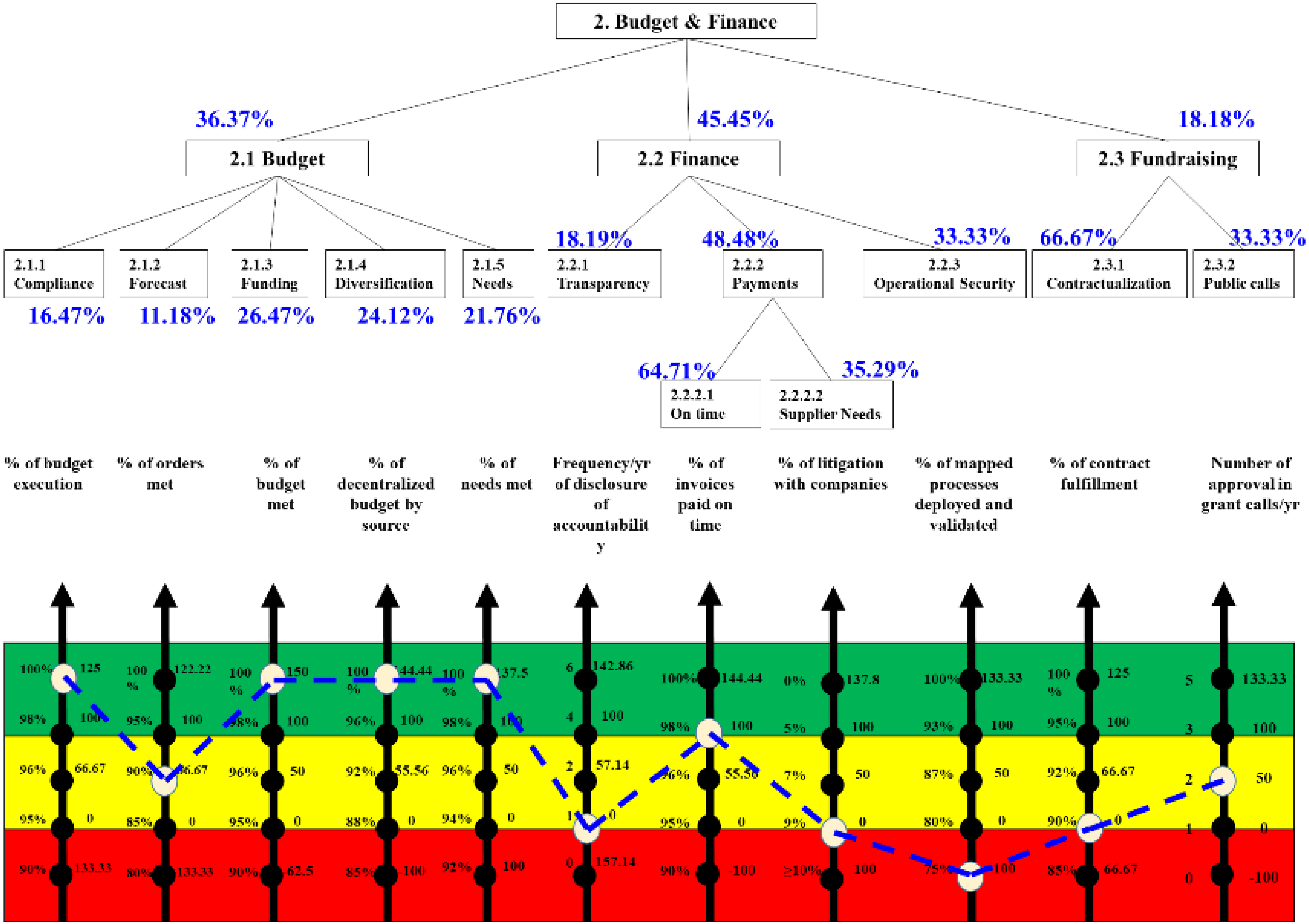
	L5	L4	L3	L2	L1	Current scale	
L5	no	moderate	strong	v. strong	extreme	125.00	extreme
L4		no	strong	v. strong	extreme	100.00	v. strong
L3			no	v. strong	extreme	66.67	strong
L2				no	extreme	0.00	moderate
L1					no	-133.33	weak
							very weak
							no

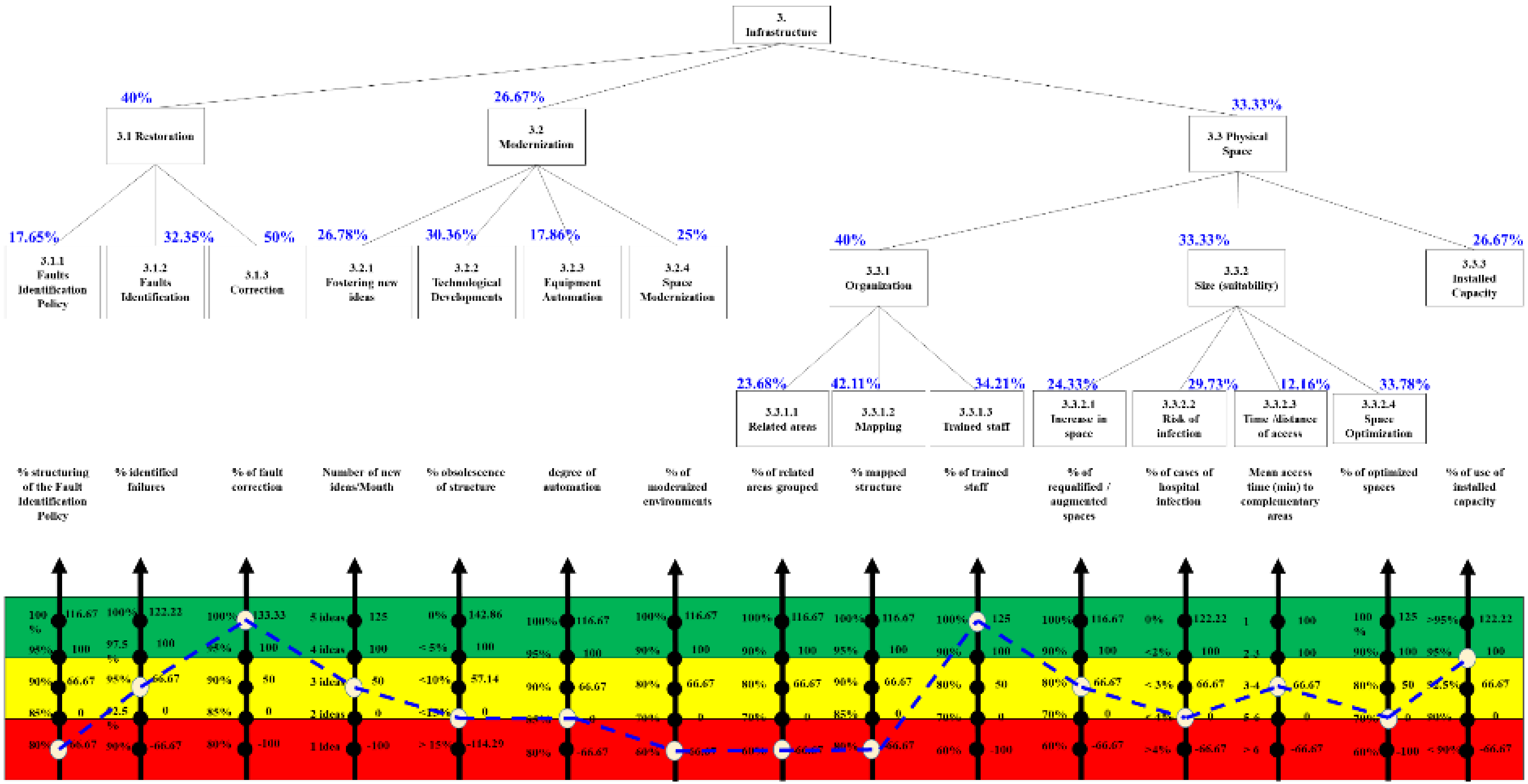

Appreciation
Judgments matrix of the difference in attractiveness
Appreciation
Number of valuing actions
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
Number of valuing actions
(a)
> 6
4 - 5
2 - 3
1
0
Value function of EPV 11.4.2 Appreciation
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
> 6 122.22
4 - 5 100
2 - 3 66.67
1 0
0 -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

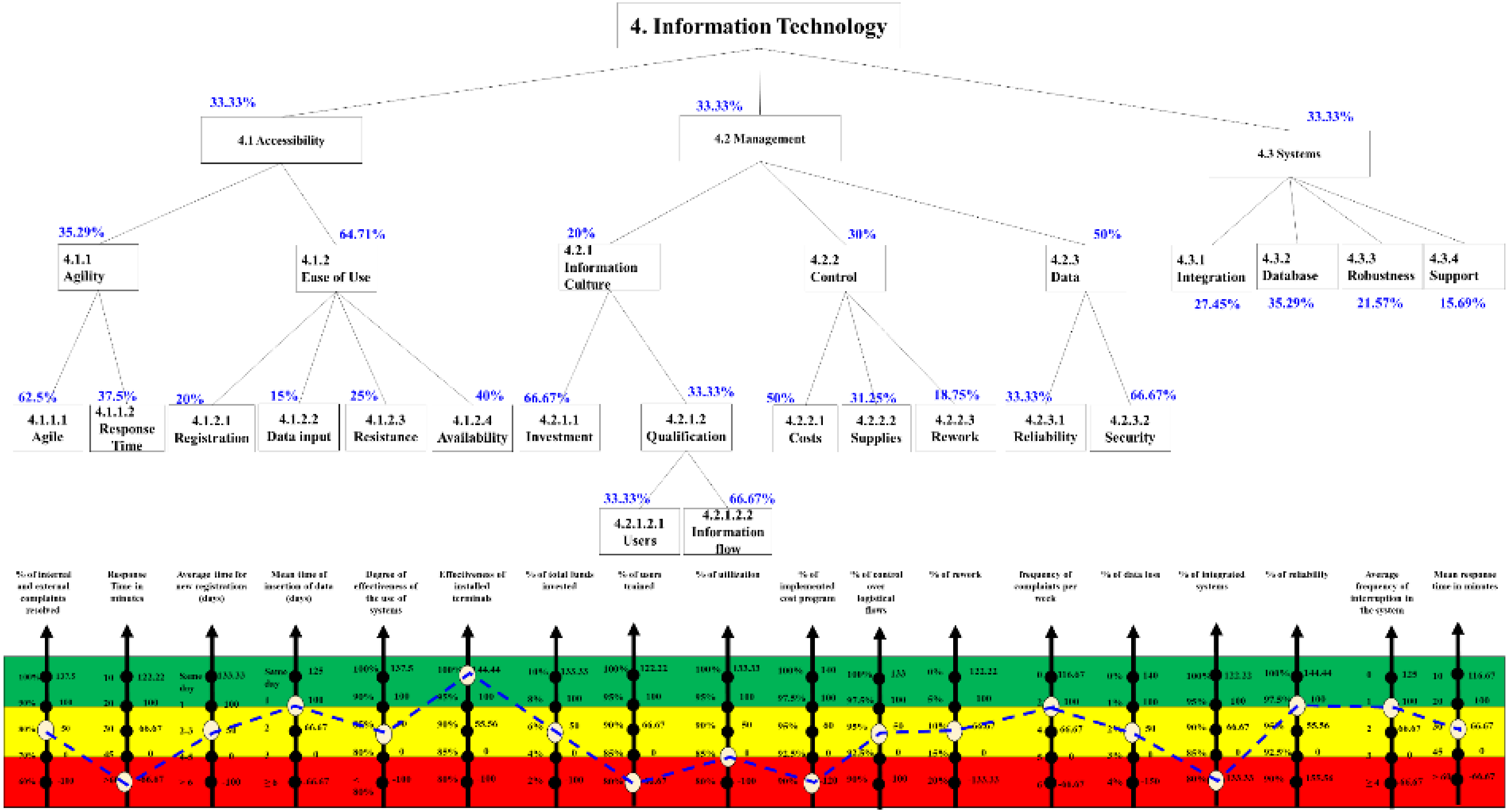

Mapping
Judgments matrix of the difference in attractiveness
Mapping
% of mapped functions
L5 L4 L3 L2 L1 Current scale
L5 no weak moderate strong v. strong 122.22
L4 no moderate strong v. strong 100.00
L3 no strong v. strong 66.67
L2 no v. strong 0.00
L1 no -133.33
extreme
v. strong
strong
moderate
weak
very weak
no
Consistent judgements
% of mapped functions
(a)
100%
90%
80%
70%
60%
Value function of EPV 11.4.3 Mapping
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
f (a)
L1 L2 L3 L4 L5
(a)
(a) f (a)
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Descriptor Ordinal Scale
Value function graph
Criterion Cardinal Scale

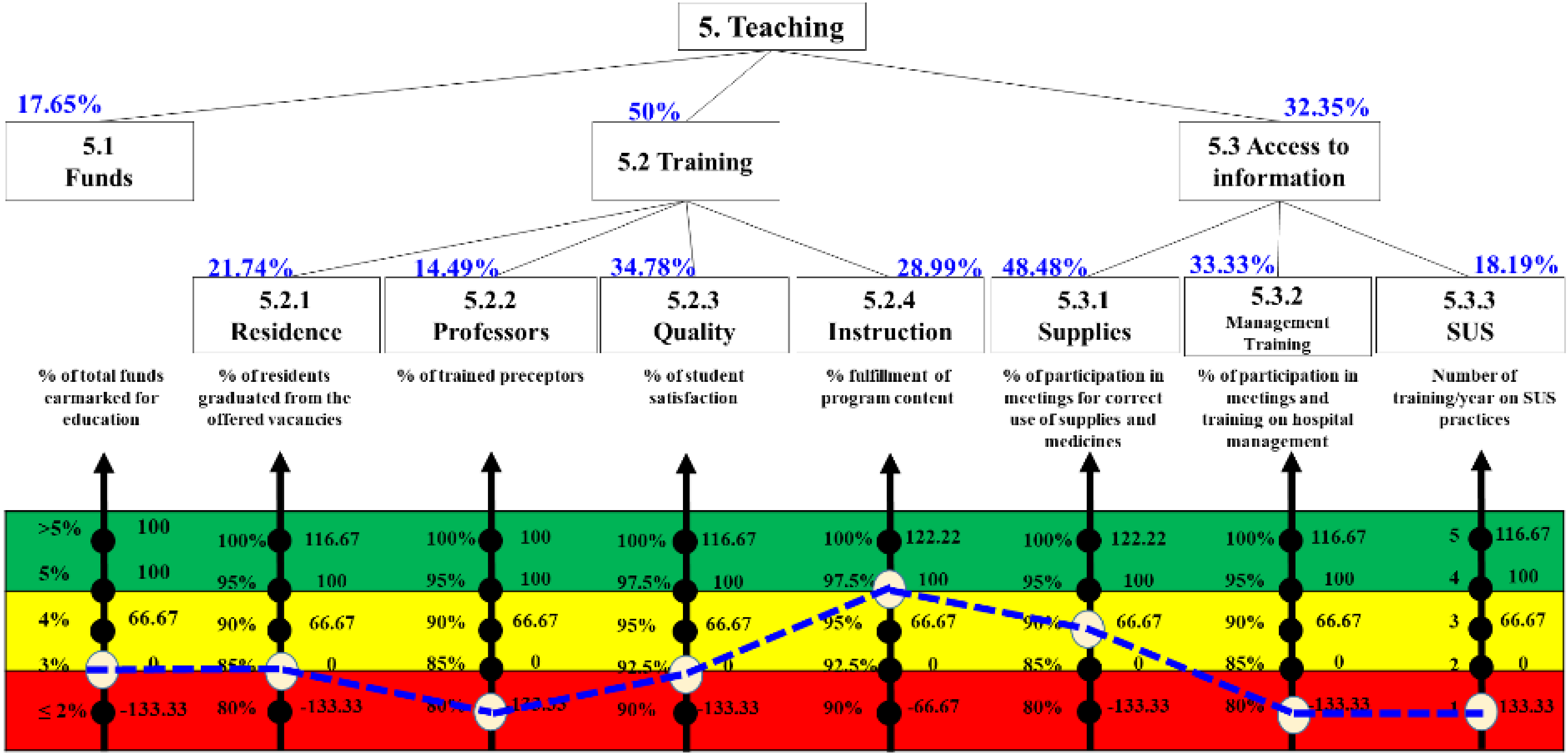
APPENDIX G: MODEL WITH COMPENSATION RATES, PERFORMANCE PROFILE

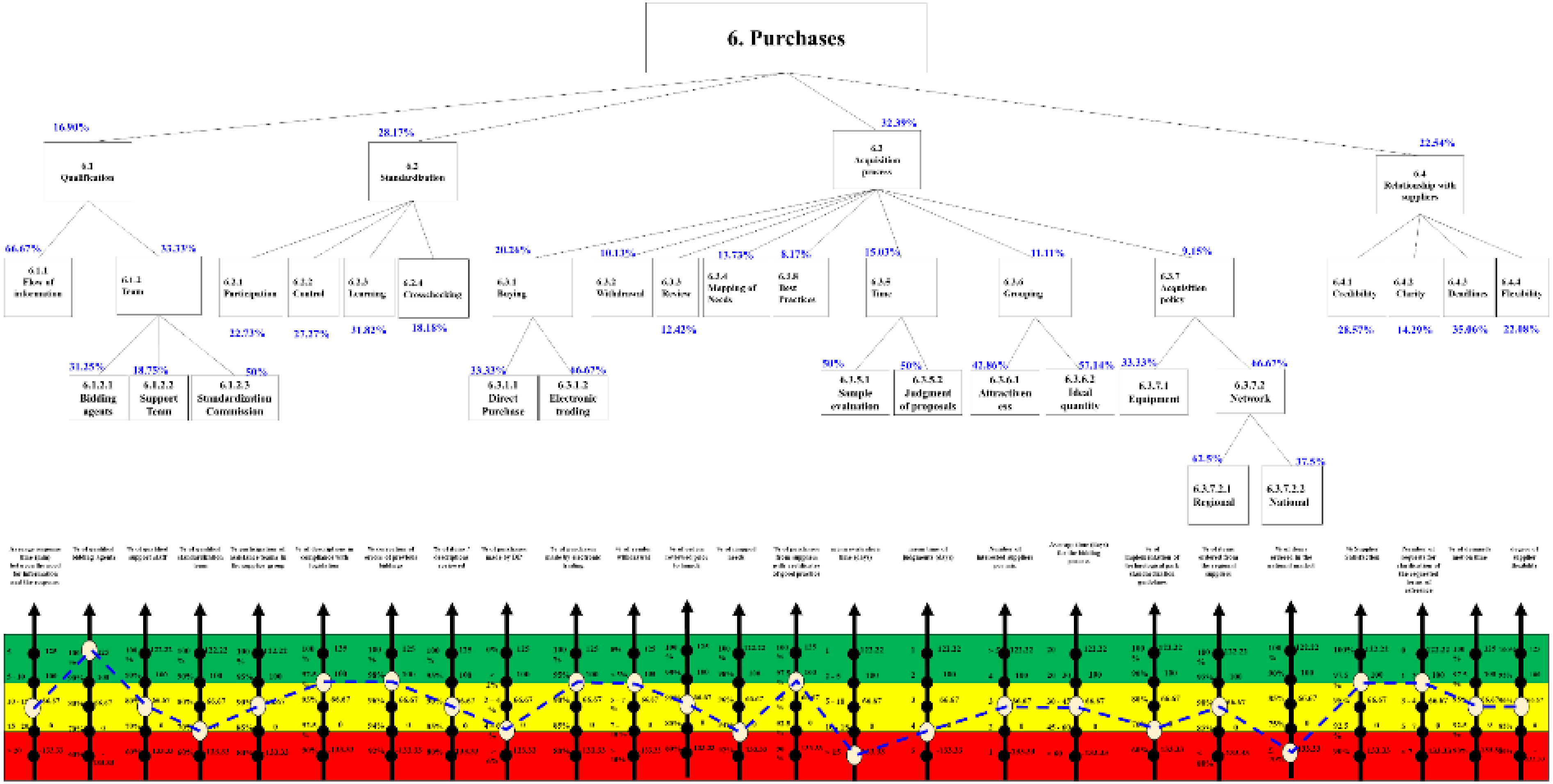


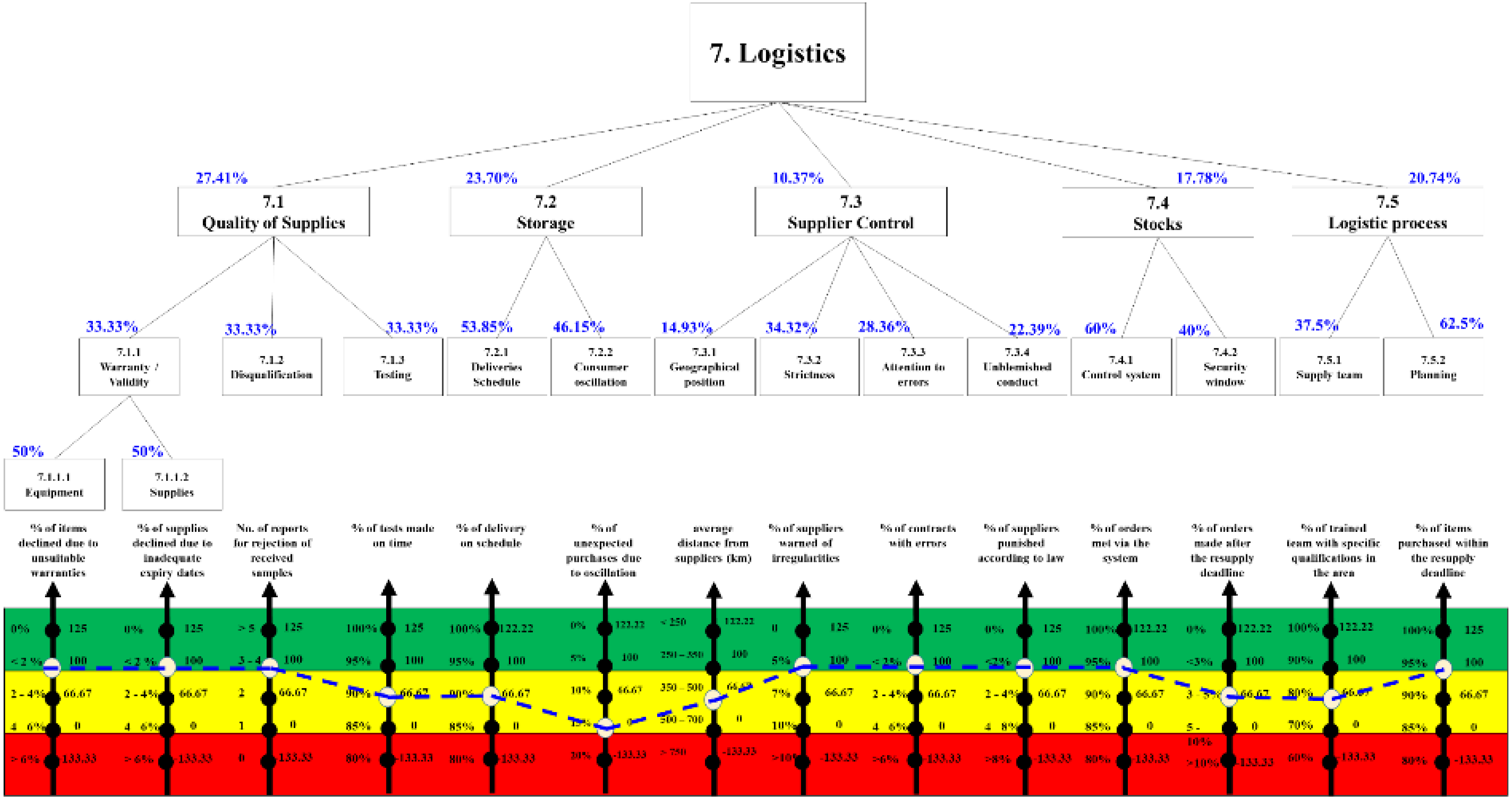

2. Budget & Finance
36.37%
45.45%
18.18%
2.1 Budget
2.2 Finance
2.3 Fundraising
2.1.1 Compliance
2.1.2 Forecast
2.1.3 Funding
2.1.4 Diversification
2.1.5 Needs
16.47%
11.18%
26.47%
24.12%
21.76%
18.19%
48.48%
33.33%
2.2.1 Transparency
2.2.2 Payments
2.2.3 Operational Security
66.67%
33.33%
2.3.1 Contractualization
2.3.2 Public calls
64.71%
35.29%
2.2.2.1 On time
2.2.2.2 Supplier Needs
% of budget execution
% of orders met
% of budget met
% of decentralized budget by source
% of needs met
Frequency/yr of disclosure of accountability
% of invoices paid on time
% of litigation with companies
% of mapped processes deployed and validated
% of contract fulfillment
Number of approval in grant calls/yr


3. Infrastructure
40%
3.1 Restoration
26.67%
3.2 Modernization
33.33%
3.3 Physical Space
17.65%
3.1.1 Faults Identification Policy
32.35%
3.1.2 Faults Identification
50%
3.1.3 Correction
26.78%
3.2.1 Fostering new ideas
30.36%
3.2.2 Technological Developments
17.86%
3.2.3 Equipment Automation
25%
3.2.4 Space Modernization
40%
3.3.1 Organization
33.33%
3.3.2 Size (suitability)
26.67%
3.3.3 Installed Capacity
23.68%
3.3.1.1 Related areas
42.11%
3.3.1.2 Mapping
34.21%
3.3.1.3 Trained staff
24.33%
3.3.2.1 Increase in space
29.73%
3.3.2.2 Risk of infection
12.16%
3.3.2.3 Time /distance of access
33.78%
3.3.2.4 Space Optimization
% structuring of the Fault Identification Policy
% identified failures
% of fault correction
Number of new ideas/Month
% obsolescence of structure
degree of automation
% of modernized environments
% of related areas grouped
% mapped structure
% of trained staff
% of requalified / augmented spaces
% of cases of hospital infection
Mean access time (min) to complementary areas
% of optimized spaces
% of use of installed capacity

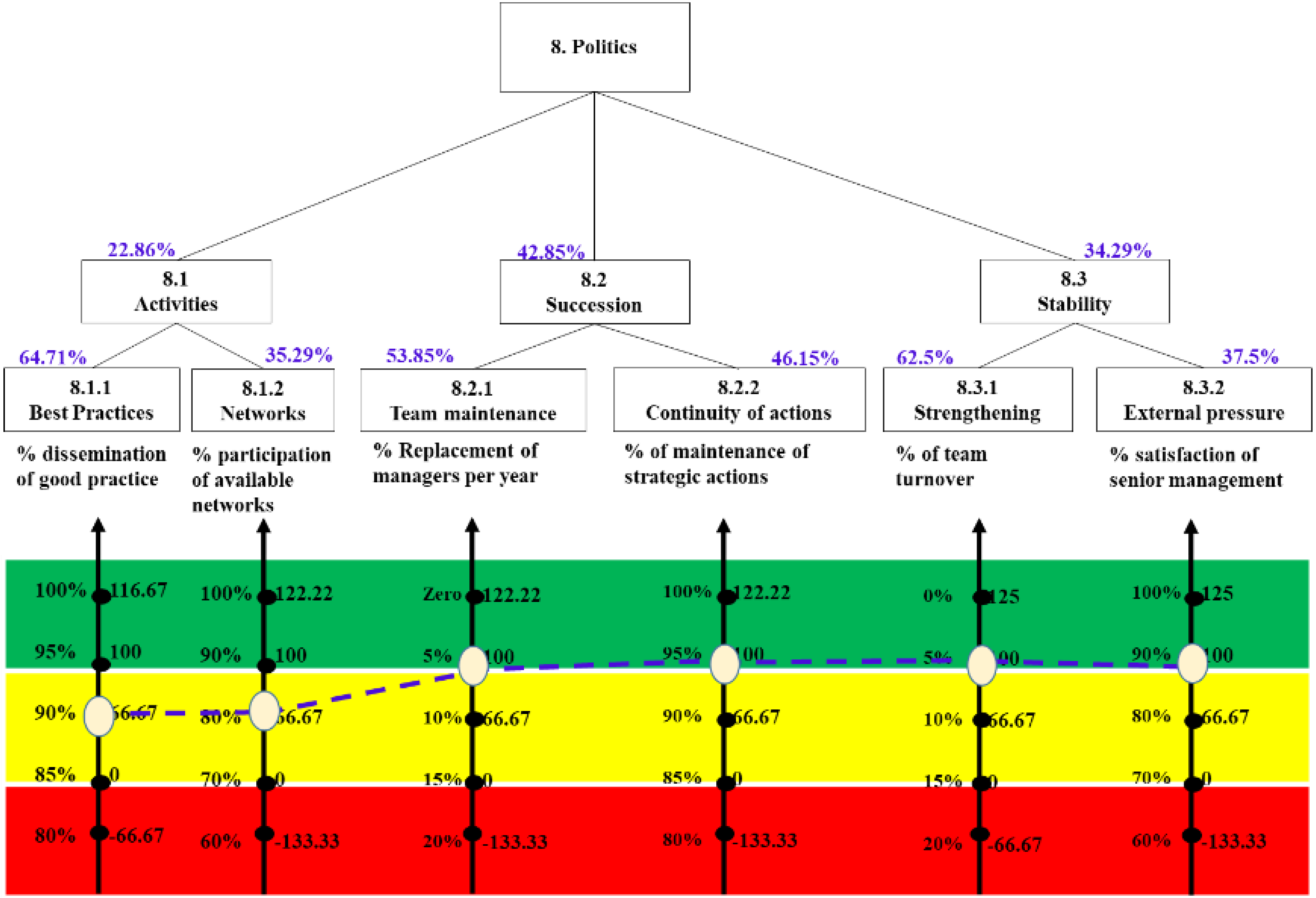

4. Information Technology
33.33%
4.1 Accessibility
33.33%
4.2 Management
33.33%
4.3 Systems
35.29%
4.1.1 Agility
64.71%
4.1.2 Ease of Use
20%
4.2.1 Information Culture
30%
4.2.2 Control
50%
4.2.3 Data
4.3.1 Integration
27.45%
4.3.2 Database
35.29%
4.3.3 Robustness
21.57%
4.3.4 Support
15.69%
62.5%
4.1.1.1 Agile
37.5%
4.1.1.2 Response Time
20%
4.1.2.1 Registration
15%
4.1.2.2 Data input
25%
4.1.2.3 Resistance
40%
4.1.2.4 Availability
66.67%
4.2.1.1 Investment
33.33%
4.2.1.2 Qualification
50%
4.2.2.1 Costs
31.25%
4.2.2.2 Supplies
18.75%
4.2.2.3 Rework
33.33%
4.2.3.1 Reliability
66.67%
4.2.3.2 Security
33.33%
4.2.1.2.1 Users
66.67%
4.2.1.2.2 Information flow

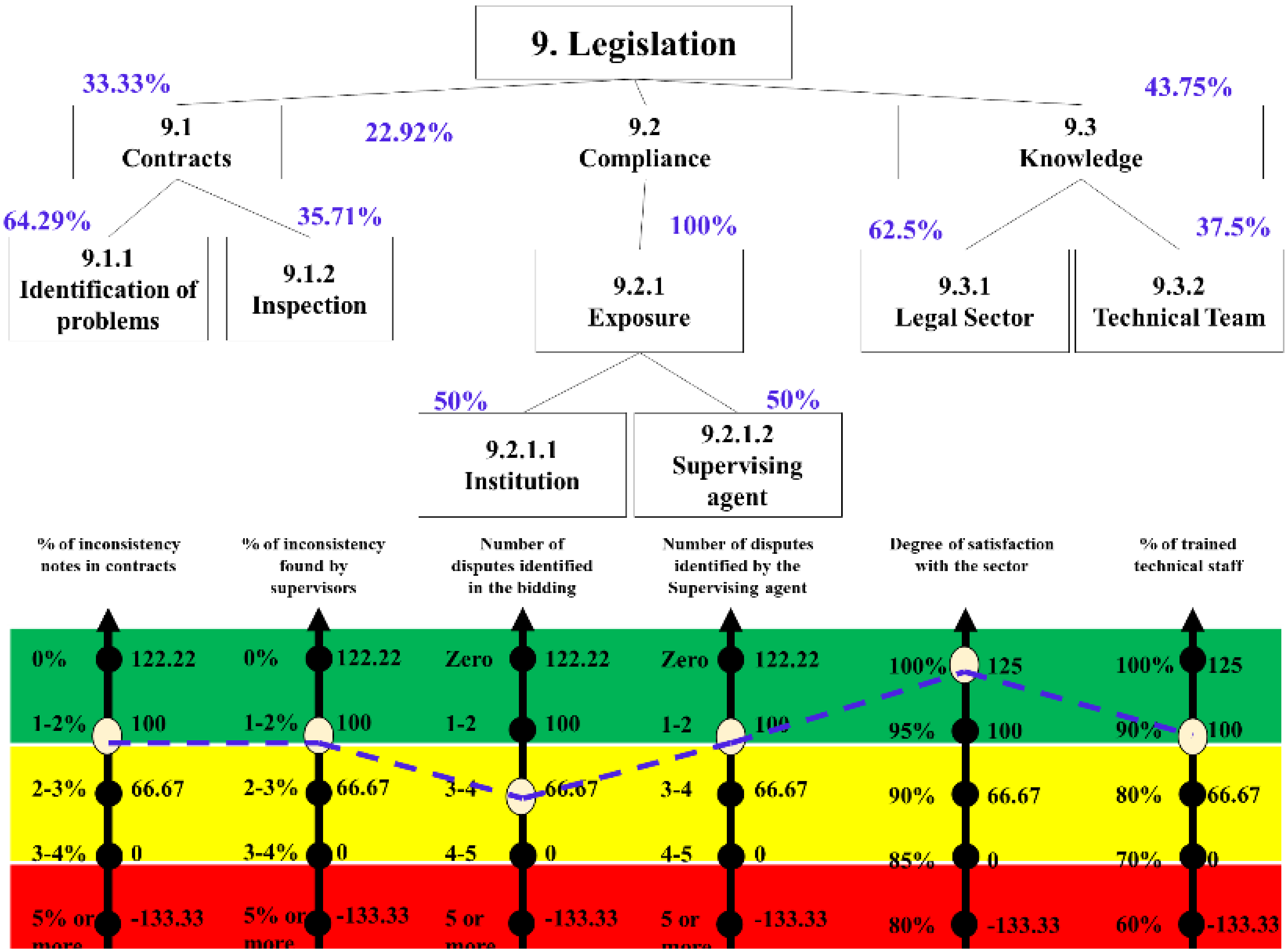

5. Teaching
17.65%
5.1
Funds
50%
5.2 Training
32.35%
5.3 Access to information
21.74%
5.2.1
Residence
14.49%
5.2.2
Professors
34.78%
5.2.3
Quality
28.99%
5.2.4
Instruction
48.48%
5.3.1
Supplies
33.33%
5.3.2
Management Training
18.19%
5.3.3
SUS
% of total funds earmarked for education
% of residents graduated from the offered vacancies
% of trained preceptors
% of student satisfaction
% fulfillment of program content
% of participation in meetings for correct use of supplies and medicines
% of participation in meetings and training on hospital management
Number of training/year on SUS practices
>5% 100
5% 100
4% 66.67
3% 0
≤ 2% -133.33
100% 116.67
95% 100
90% 66.67
85% 0
80% -133.33
100% 100
95% 100
90% 66.67
85% 0
80% -133.33
100% 116.67
97.5% 100
95% 66.67
92.5% 0
90% -133.33
100% 122.22
97.5% 100
95% 66.67
92.5% 0
90% -66.67
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
100% 116.67
95% 100
90% 66.67
85% 0
80% -133.33
5 116.67
4 100
3 66.67
2 0
1 133.33

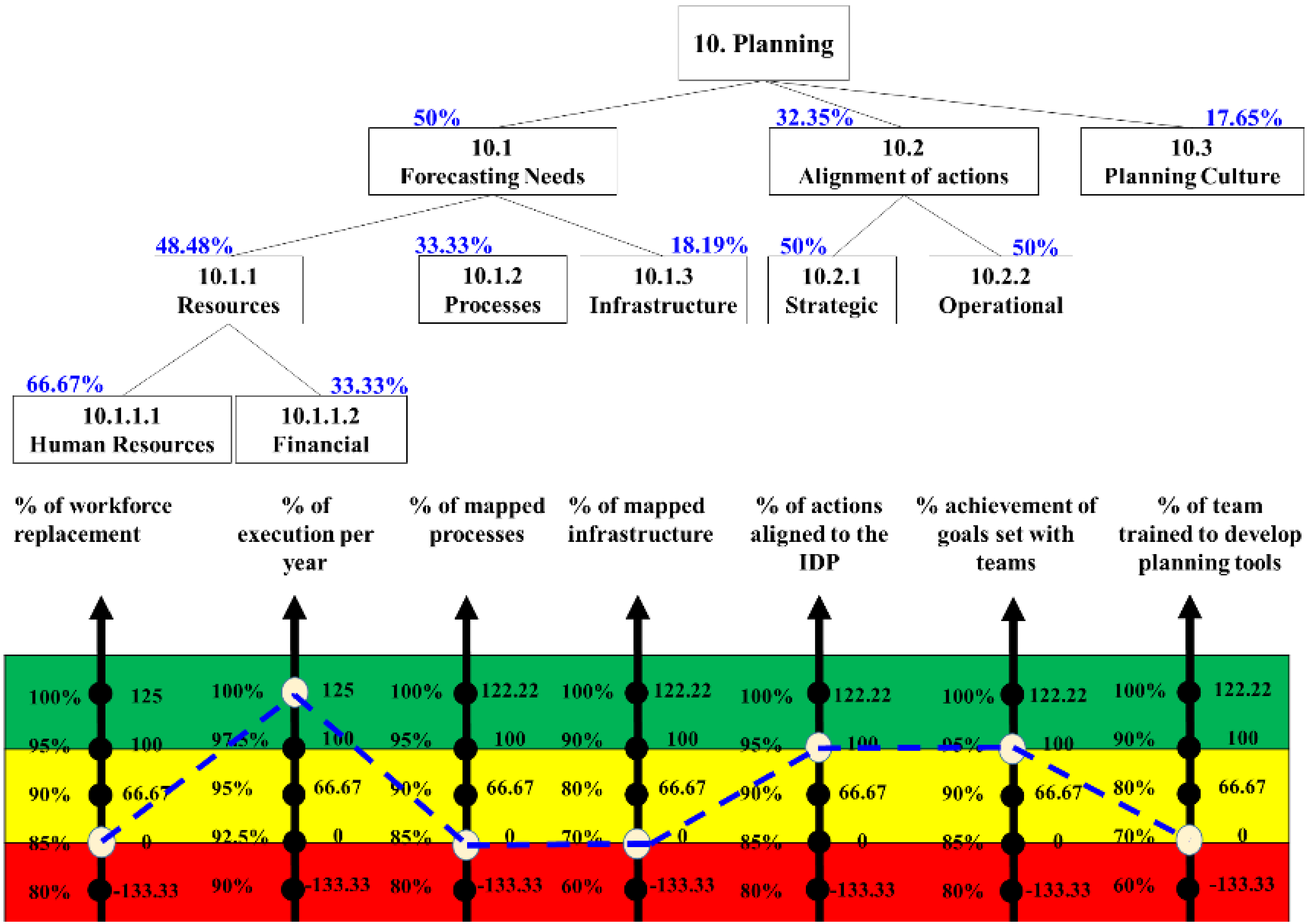

6. Purchases
16.90%
28.17%
32.39%
22.54%
6.1 Qualification
6.2 Standardization
6.3 Acquisition process
6.4 Relationship with suppliers
66.67%
33.33%
6.1.1 Flow of information
6.1.2 Team
31.25%
18.75%
50%
6.1.2.1 Bidding agents
6.1.2.2 Support Team
6.1.2.3 Standardization Commission
6.2.1 Participation
6.2.2 Control
6.2.3 Learning
6.2.4 Crosschecking
22.73%
27.27%
31.82%
18.18%
20.24%
10.12%
13.73%
8.17%
15.03%
11.11%
9.15%
6.3.1 Buying
6.3.2 Withdrawal
6.3.3 Review
6.3.4 Mapping of Needs
6.3.8 Best Practices
6.3.5 Time
6.3.6 Grouping
6.3.7 Acquisition policy
12.42%
33.33%
66.67%
6.3.1.1 Direct Purchase
6.3.1.2 Electronic trading
50%
50%
6.3.5.1 Sample evaluation
6.3.5.2 Judgment of proposals
42.86%
57.14%
6.3.6.1 Attractiveness
6.3.6.2 Ideal quantity
33.33%
66.67%
6.3.7.1 Equipment
6.3.7.2 Network
62.5%
37.5%
6.3.7.2.1 Regional
6.3.7.2.2 National
6.4.1 Credibility
6.4.2 Clarity
6.4.3 Deadlines
6.4.4 Flexibility
28.57%
14.29%
35.06%
22.08%



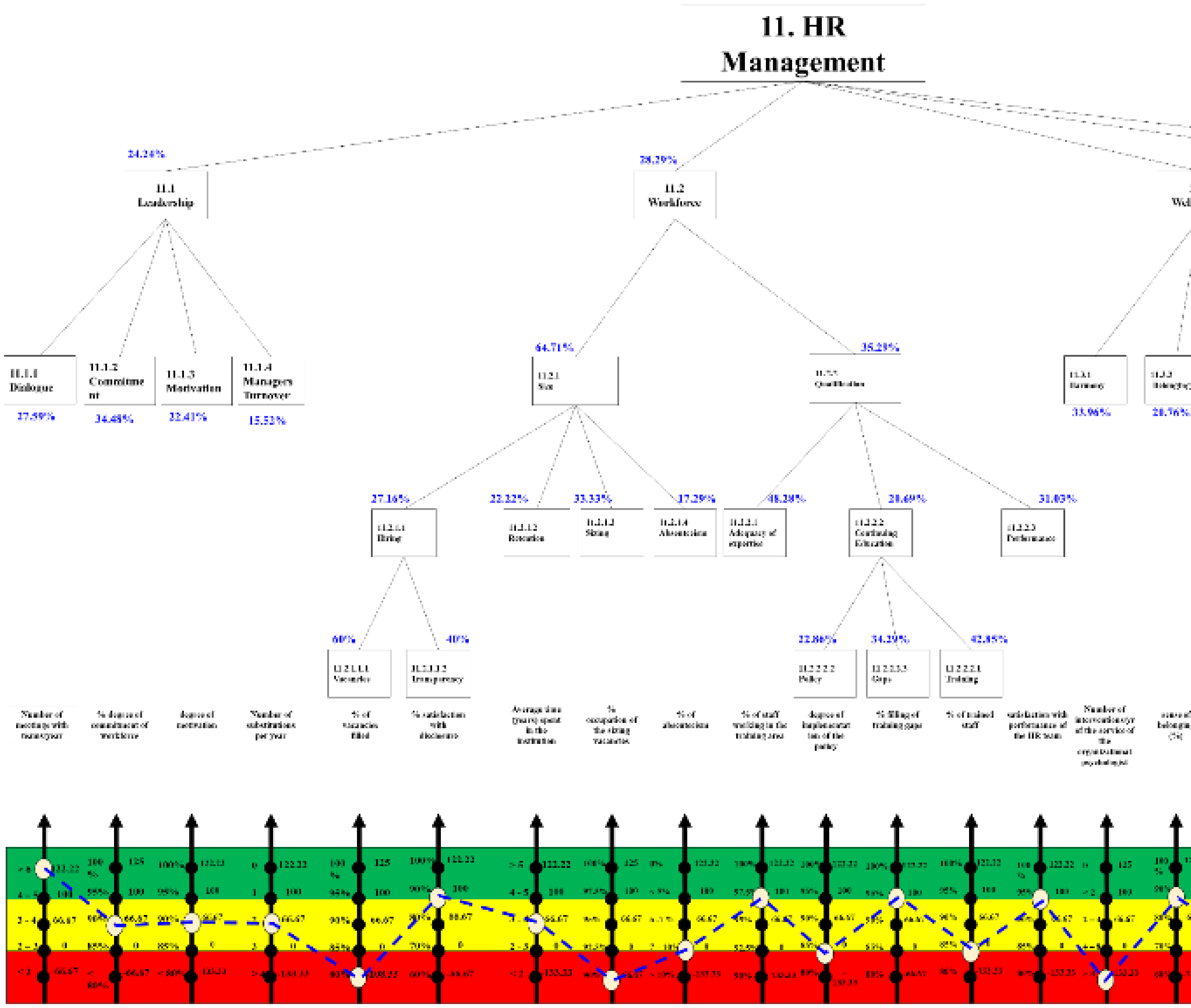
7. Logistics
27.41%
7.1
Quality of Supplies
23.70%
7.2
Storage
10.37%
7.3
Supplier Control
17.78%
7.4
Stocks
20.74%
7.5
Logistic process
33.33%
7.1.1
Warranty / Validity
33.33%
7.1.2
Disqualification
33.33%
7.1.3
Testing
53.85%
7.2.1
Deliveries Schedule
46.15%
7.2.2
Consumer oscillation
14.93%
7.3.1
Geographical position
34.32%
7.3.2
Strictness
28.36%
7.3.3
Attention to errors
22.39%
7.3.4
Unblemished conduct
60%
7.4.1
Control system
40%
7.4.2
Security window
37.5%
7.5.1
Supply team
62.5%
7.5.2
Planning
50%
7.1.1.1
Equipment
50%
7.1.1.2
Supplies
% of items declined due to unsuitable warranties
0% 125
< 2 % 100
2 - 4% 66.67
4 6% 0
> 6% -133.33
% of supplies declined due to inadequate expiry dates
0% 125
< 2 % 100
2 - 4% 66.67
4 6% 0
> 6% -133.33
No. of reports for rejection of received samples
> 5 125
3 - 4 100
2 66.67
1 0
0 -133.33
% of tests made on time
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
% of delivery on schedule
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
% of unexpected purchases due to oscillation
0% 122.22
5% 100
10% 66.67
0
20% -133.33
average distance from suppliers (km)
< 250 122.22
250 – 350 100
350 – 500 66.67
500 – 700 0
> 750 -133.33
% of suppliers warned of irregularities
0 125
5% 100
7% 66.67
10% 0
>10% -133.33
% of contracts with errors
0% 125
< 2% 100
2 - 4% 66.67
4 6% 0
>6% -133.33
% of suppliers punished according to law
0% 125
<2% 100
2 - 4% 66.67
4 8% 0
>8% -133.33
% of orders met via the system
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
% of orders made after the resupply deadline
0% 122.22
<3% 100
66.67
5 - 10% 0
>10% -133.33
% of trained team with specific qualifications in the area
100% 122.22
90% 100
80%
70% 0
60% -133.33
% of items purchased within the resupply deadline
100% 125
95% 100
90% 66.67
85% 0
80% -133.33


8. Politics
22.86%
8.1
Activities
42.85%
8.2
Succession
34.29%
8.3
Stability
64.71%
8.1.1
Best Practices
35.29%
8.1.2
Networks
53.85%
8.2.1
Team maintenance
46.15%
8.2.2
Continuity of actions
62.5%
8.3.1
Strengthening
37.5%
8.3.2
External pressure
% dissemination of good practice
% participation of available networks
% Replacement of managers per year
% of maintenance of strategic actions
% of team turnover
% satisfaction of senior management
100% 116.67
95% 100
90% 66.67
85% 0
80% -66.67
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
Zero 122.22
5% 100
10% 66.67
15% 0
20% -133.33
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
0% 125
5% 100
10% 66.67
15% 0
20% -66.67
100% 125
90% 100
80% 66.67
70% 0
60% -133.33


9. Legislation
33.33%
9.1
Contracts
22.92%
9.2
Compliance
43.75%
9.3
Knowledge
64.29%
9.1.1
Identification of problems
35.71%
9.1.2
Inspection
100%
9.2.1
Exposure
62.5%
9.3.1
Legal Sector
37.5%
9.3.2
Technical Team
50%
9.2.1.1
Institution
50%
9.2.1.2
Supervising agent
% of inconsistency notes in contracts
% of inconsistency found by supervisors
Number of disputes identified in the bidding
Number of disputes identified by the Supervising agent
Degree of satisfaction with the sector
% of trained technical staff
0% 122.22
1-2% 100
2-3% 66.67
3-4% 0
5% or more -133.33
0% 122.22
1-2% 100
2-3% 66.67
3-4% 0
5% or more -133.33
Zero 122.22
1-2 100
3-4 66.67
4-5 0
5 or more -133.33
Zero 122.22
1-2 100
3-4 66.67
4-5 0
5 or more -133.33
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
100% 125
90% 100
80% 66.67
70% 0
60% -133.33



10. Planning
50%
10.1
Forecasting Needs
32.35%
10.2
Alignment of actions
17.65%
10.3
Planning Culture
48.48%
10.1.1
Resources
33.33%
10.1.2
Processes
18.19%
10.1.3
Infrastructure
50%
10.2.1
Strategic
50%
10.2.2
Operational
66.67%
10.1.1.1
Human Resources
33.33%
10.1.1.2
Financial
% of workforce replacement
% of execution per year
% of mapped processes
% of mapped infrastructure
% of actions aligned to the IDP
% achievement of goals set with teams
% of team trained to develop planning tools
100% 125
95% 100
90% 66.67
85% 0
80% -133.33
100% 125
97.5% 100
95% 66.67
92.5% 0
90% -133.33
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
100% 122.22
95% 100
90% 66.67
85% 0
80% -133.33
100% 122.22
90% 100
80% 66.67
70% 0
60% -133.33



APPENDIX H: ACTION PLANS FOR COMPROMISING PERFORMANCE LEVELS

The critical performance factor to be improved:	1.1.2.1 Collaborators
Descriptor:	% achievement of projected workforce quantity
Proposed Actions:	– Create a working group from all network members to lobby with the federal government for more vacancies; – Get in touch with newly selected and candidates to accelerate the hiring process – Have an active HR sector to meet the needs of employees and keep or improve retention rates.
Responsible:	Coordinator of Human Resources
Deadline:	Second semester 2019

Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	HR Division
Expected result:	Change from "80% achievement" to "95% achievement of projected quantity"
Descriptor Impact:	Improving from L1 (-114.29) to L4 (100)

The critical performance factor to be improved:	1.3.2.2.2 Stay
Descriptor:	Degree of implementation and operation of the talent pool
Proposed Actions:	– Streamline the triage process; – Create a work group with interdisciplinary membership to study improvement actions; – Add a flow nurse coordinator;
Responsible:	Flow nurse coordinator
Deadline:	Second semester of 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Care Management Division
Expected result:	Change from "45 minutes" to "20 minutes"
Descriptor Impact:	Improving from L1 (-120) to L4 (100)

The critical performance factor to be improved:	1.4.1 Specialties
Descriptor:	% of new specialties covered by professionals
Proposed Actions:	– Create a working group to study the viability of new areas of specialties – Have a database of current workforce and their qualification – Verify with other network members possibilities of new areas of activity
Responsible:	Care Management Division
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Health Care Manager

Expected result:	Change from "80%" to "95%"
Descriptor Impact:	Improving from L1 (-100) to L4 (100)

The critical performance factor to be improved:	11.2.1.1.1 Vacancies
Descriptor:	*% of vacancies filled*
Proposed Actions:	– Create a working group from all network members to lobby with the federal government for more vacancies; – Have all available vacancies filled up as soon as they are available;
Responsible:	Human Resources Coordinator
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	HR Division Manager
Expected result:	Change from "80%" to "95%"
Descriptor Impact:	Improving from L1 (-108.33) to L4 (100)
Critical performance factor to be improved:	11.3.1 Harmony
Descriptor:	Number of interventions/yr of the service of the organizational psychologist
Proposed Actions:	– Create a task force to develop strategies for conflict resolution; – Identify behavioral tendencies that seem to trigger certain attitudes, provoke mindset shifts, or demonstrate a lack of self-awareness; – Have a set of established ground rules to keep everyone safe; – Identify conflict boundaries to establish standards that will help prevent conflict from arising;
Responsible:	Chief Organizational Psychologist
Deadline:	Second semester de 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	DivGP
Expected result:	Change from 'More than 8 interventions' to 'Less than 2

	interventions'
Descriptor Impact:	Improving from N1 (-133.33) to N4 (100)

The critical performance factor to be improved:	11.2.1.3 Sizing
Descriptor:	% occupation of the sizing vacancies
Proposed Actions:	- Create a working group from all network members to lobby with the federal government for more vacancies;
Responsible:	HR Coordinator
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	HR Division Manager
Expected result:	Change from "90%" to "97.5%"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	11.4.3 Mapping
Descriptor:	% of mapped functions
Proposed Actions:	– Adopt the competency matrix for the recognition of staff – Identify strategic skills and competences – Establish evaluation criteria for key positions – Create a work group with interdisciplinary membership to identify unmapped functions
Responsible:	HR Coordinator
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	HR Division Manager
Expected result:	Change from "60%" to "90%"
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

The critical performance factor to be improved:	6.3.5.1 Sample evaluation

Descriptor:	mean evaluation time (days)
Proposed Actions:	– Have a precise definition of the object with the specification of attributes indispensable to the minimum quality of the product. – qualify the standardization committee – require submission of technical reports to guarantee the quality of the property to be acquired – Set in the tender technical criteria and evaluation goals. – Register the all the evaluation times in the system – Have a complementary test sample assessment term
Responsible:	Purchases Unit
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the reports on evaluation
Responsible for supervising:	Administrative Sector
Expected result:	Change from ">15 days" to "2-5 days"
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

The critical performance factor to be improved:	6.3.7.2.2 National
Descriptor:	% of items ordered in the national market
Proposed Actions:	- Create a working group to analyze products that are better purchased in the national market; - Create a list of products to be purchased exclusively in the national network;
Responsible:	Purchases Unit
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Administrative Sector
Expected result:	Change from "<70%" to "90%"
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

The critical performance factor to	4.1.1.2 Response Time

be improved:	
Descriptor:	Response Time in minutes
Proposed Actions:	- Implement first response time policy - Gather and inspect existing performance and data; - Monitor and alert for any future performance regressions;
Responsible:	Technical Support team
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the first response times
Responsible for supervising:	TI Sector
Expected result:	Change from ">60" to "20 minutes"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	4.2.1.2.1 Users
Descriptor:	% of users trained
Proposed Actions:	- Establish a Training Team - Develop a Content Outline on what should be covered in the training - Design any support materials that may be needed for use during training - Design a layout of the training manual, and what each functional and technical areas of the system should be included.
Responsible:	Technical Support team
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the progress with the training team
Responsible for supervising:	TI Sector
Expected result:	Change from "80%" to "90% of users"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	4.2.2.1 Costs
Descriptor:	% of implemented cost program

Proposed Actions:	- Create a work group with interdisciplinary membership to identify the institution needs on the cost program; - Map all costs involved in the running of the hospital;
Responsible:	Software development team
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the progress of the work group
Responsible for supervising:	IT Sector
Expected result:	Change from "90%" to " 97.5% "
Descriptor Impact:	Improving from L1 (-120) to L4 (100)

Critical performance factor to be improved:	EPV 4.3.1 Integration
Descriptor:	% of integrated systems
Proposed Actions:	- Create a multidisciplinary working group(WG) to map all candidate Integration processes; - Establish a schedule for the working group findings and final report; - Request the IT sector to support the WG; - Implement the integration of all the organization processes in the system; - Test all the processes before launch; - To encourage the staff to actively participate in the system tests;
Responsible:	Head of the IT Sector
Deadline:	1st semester of 2020
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	General Manager
Expected result:	Change from ‘<80% Integration of systems’ to ‘80% Integration of systems’
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

The critical performance factor to be improved:	3.1.1 Faults Identification Policy

Descriptor:	% structuring of the Fault Identification Policy
Proposed Actions:	- Create a working group to completely structure the policy; - Present the policy to the entire infrastructure team for appreciation and improvement; - Add the new suggestions to the policy;
Responsible:	Physical Infrastructure sector
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Logistics and Hospital Infrastructure sector
Expected result:	Change from "80%" to "Pool working with up to 95% implemented"
Descriptor Impact:	Improving from L1 (-50) to L4 (100)

The critical performance factor to be improved:	3.2.4 Space Modernization
Descriptor:	% of modernized environments
Proposed Actions:	- Create a work group with interdisciplinary membership to identify new trends; - Map current spaces and report on spaces that can be modernized;
Responsible:	Physical Infrastructure sector
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Logistics and Hospital Infrastructure sector
Expected result:	Change from "60%" to "90% modernization"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	3.3.1.1 Related areas
Descriptor:	% of related areas grouped together
Proposed Actions:	- Map current spaces and report on spaces that can be grouped; - Create a work group to evaluate the viability of the

	changes in the allocation of spaces; - Group related processes inti the same working space to take advantage of the proximity;
Responsible:	Physical Infrastructure sector
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
Responsible for supervising:	Logistics and Hospital Infrastructure sector
Expected result:	Change from "60%" to "90%"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	3.3.1.2 Mapping
Descriptor:	% mapped structure
Proposed Actions:	- Map current hospital structure and report on areas and processes that can be improved;
Responsible:	Physical Infrastructure sector
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
Responsible for supervising:	Logistics and Hospital Infrastructure sector
Expected result:	Change from "80%" to "95%"
Descriptor Impact:	Improving from L1 (-66.67) to L4 (100)

The critical performance factor to be improved:	2.2.3 Operational Security
Descriptor:	% of mapped processes deployed and validated
Proposed Actions:	- Create a working group to analyze processes that have not yet been mapped and validated - Get countermeasures in place in case of problems
Responsible:	General Manager
Deadline:	Second semester 2019
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the Schedule with the working group
Responsible for supervising:	Superintendent
Expected result:	Change from "75%" to "93%"

Descriptor Impact:	Improving from L1 (-100) to L4 (100)

The critical performance factor to be improved:	5.2.2 Professors
Descriptor:	% of trained preceptors
Proposed Actions:	- Promote qualification of lecturers through special programs; - Support their efforts to undertake post-graduate studies; - Promote the exchange of experiences with professional;
Responsible:	Academic Division
Deadline:	Second semester of 2019
Supervision Frequency:	Annually
How it will be supervised:	Assessing the performance evaluation reports
Responsible for supervising:	Management Education and Research (GEP)
Expected result:	Change from "80%" to "95%"
Descriptor Impact:	Improving from L1 (-50) to L4 (100)

Critical performance factor to be improved:	5.3.2 Management Training
Descriptor:	% of participation in meetings and training on hospital management
Proposed Actions:	- Introduce a new subject on Hospital Management, to qualify the graduates on supply chain and hospital management; - Promote regular trainings on Hospital Management; - Promote School-service integration practices to introduce the students to the SCM reality; - Include SC professionals in the construction, curricular development and the accompaniment of the students in the place of work, in the quality of collaborating professors.
Responsible:	Academic Division
Deadline:	1st semester of 2020
Supervision Frequency:	Monthly
How it will be supervised:	Monitoring the enrollment and participation of students

	in the initiative
Responsible for supervising:	Course Coordinator
Expected result:	Change from “80% participation” to “97.5% participation in meetings and training on hospital management”
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

Critical performance factor to be improved:	5.3.3 SUS
Descriptor:	Number of trainings/year on SUS practices
Proposed Actions:	- Create a minimum requirement of trainings on the Unified Health System for graduating students; - Promote regular trainings on SUS best practices; - Strengthen collaborative actions on the part of both teachers and care professionals, due to the relevance of both in the process of teaching and learning and in the transformation of health practices
Responsible:	Academic Division
Deadline:	1st semester of 2020
Supervision Frequency:	Semester
How it will be supervised:	Monitoring the student records for each student to verify requirements
Responsible for supervising:	Course Coordinator
Expected result:	Change from “1 training per year” to " “4 trainings per year”
Descriptor Impact:	Improving from L1 (-133.33) to L4 (100)

APPENDIX I: GLOBAL ASSESSMENT OF HU-FURG / EBSERH SUPPLY CHAIN MANAGEMENT