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Designing a Comprehensive Model for Developing a Smart Organizational Knowledge Map: A Hyper-Hybrid Approach Based on Meta-Ethnography

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Abstract

This study aimed to design a comprehensive model for intelligent organizational knowledge mapping with a hyper-hybrid approach based on meta-ethnography. In this article, various sources and theories about the knowledge map have been examined and analyzed using the meta-combined and meta-ethnography methods. Using the results of the work, a comprehensive model of knowledge map has been developed. Based on the qualitative approach in this research, the meta-hybrid method based on meta-ethnography has been used. The tool used has been articles related to mapping knowledge for smart organizations. A total of 34 pieces of research were found with the keywords related to designing and developing the knowledge map in the title field. Finally, after 4 stages of refinement, out of 34 studies, 8

were excluded and 26 studies were selected for data analysis. In this article, by examining and analyzing various patterns of knowledge map development, finally, an 11-step model was developed. The proposed model of eleven basic steps, respectively, includes: determining the knowledge objectives of these centers by developing knowledge maps and identifying users of knowledge maps, identifying definitions and terminology of knowledge centers, identifying the basic processes of these centers, and drawing and analyzing its process maps, Knowledge extraction from the activities in the processes of smart organizations according to the process map, creating a profile for the extracted knowledge, creating knowledge connections and relationships and integrating these connections into an illustrated interface, and finally validating the developed knowledge map.

Keywords: Knowledge Map, Organizational Knowledge, Intelligent/smart Organization, Digital Knowledge, Meta-Ethnography.

1. Introduction

Employees in the organization have a lot of knowledge, skills, and experience in specialized fields that they have acquired during their studies or in-service training or empirically (Panir et al., 2018). Now, if employees leave the organization for any reason, their knowledge will go out with them (Erceg & Zoranovic, 2022). This lost knowledge causes serious damage to the organization. Many organizations today have realized that they need something more than accidental and unconscious access to integrated knowledge in order to succeed in economics, both in the present and in the future, (Zbuchea & Vidu, 2018). Managing this knowledge, which is considered a vital resource in an intelligent organization, requires people who identify and understand knowledge and document the real impact of knowledge in the organization (Adamczewski, 2018). Information technology has brought new forms of organization, work, family, a new economic system, new political conflicts, and, most importantly, context-transformed consciousness; Hence, most modern organizations face new challenges (Stifter, 2016). Increasing customer impact, intense competition, shortening the production cycle, and continuity and acceleration in technology change are among the issues that have created new levels of dynamism and complexity for organizations. The application of information technology can provide a competitive advantage, increase customer service or create a flexible production environment (Adamik et al., 2021). In this regard, one of the issues facing organizations is identifying the knowledge in the organization and classifying them for purposeful sharing. To achieve this goal, one of the knowledge management tools used is knowledge maps (Destler, 2016). A knowledge map is used as a guide to show the place of knowledge or the possibility of storing it in the organization. In this sense, a knowledge map is nothing more than a list of experts, documents, and databases that guide people when they need knowledge. (Markus et al., 2017).

Also, in the current situation, one of the best ways to manage organizational knowledge is to prepare a map of the knowledge available in that organization. A knowledge map is a knowledge management tool and through it, the users of the organization are given information about the location of knowledge and knowledge resources, including people with knowledge, documents, and information. In general, it can be said that the knowledge map of

specialties and the required knowledge of resources and databases identify people with their location in the organization (Kane, 2019).

Having a business with maximum optimality is the dream of every company and organization (Keshavarz et al., 2018). What companies are looking for is to display fast but strategic and very specific information about the general situation of their company so that they can make the best decision in the shortest possible time, resulting in increased company productivity and thus more profit (Valdez-Juarez Et al., 2018).

Organizational intelligence can ensure the success of the organization by focusing on the growth and strengthening of the organization. Accelerating service delivery and reducing process time, reducing manpower costs, providing uninterrupted services, business transparency, establishing knowledge bases for training, and developing digital tools are among the benefits of organizational intelligence (Porter, 2014).

Knowledge maps help managers to achieve a proper analysis of organizational problems and make more informed decisions to improve the organization's position in the future (Matheson et al., 2001). An intelligent organization enhances its performance by linking the knowledge of three groups of specialists (professionals, information specialists, and IT specialists) and relying on the existing knowledge in the organization (tacit, explicit, contextual, and meta-knowledge), the knowledge and skills of information specialists, it is considered the knowledge base of the intelligent organization, which is an essential element of organizational intelligence (Soto-Acosta & Cegarra-Navarro, 2016).

In a managerial environment, conceptually, intelligent agents are defined as entities that can understand the meaning of a particular situation, be situational, and act according to a set of guidelines and strategies. While knowledge systems enhance the professional performance of individuals, individuals are also prepared to create or disseminate the knowledge required by the organization (Drechsler et al., 2020). Intelligent agents play a vital role in creating new benefits and actively participating in innovations related to digital technologies because this is the key to organizational development in the direction of digital transformation (Petrov et al., 2020).

The need for a knowledge map template stems from the fact that it helps managers and employees of the organization to graphically

observe and analyze the organization's knowledge resources, knowledge needs, the relationship between them and the relationships that govern them, and thus in making big decisions and ultimately solving organizational problems they play an important role. The knowledge map for the intelligence of traditional organizations depends on the intelligence of the people who work there as well as the managers of that organization. But smart organizations are different (Ribeiro, 2020).

In these organizations, information is placed intelligently. In addition to benefiting from the intelligence of internal elements, they achieve comprehensive intelligence, which is independent from the intelligence of their components. The first characteristic of smart organizations is their variability. Organizations that run without smart technology change only as much as changing their manager, because the manager must spend time and energy on any change in the organization to be able to analyze data and attract employees and their participation (Ross, 2018) . In fact, teams can bring together an effective combination of smart agents, and have the right set of knowledge, information, skills, and solutions to unpredictable problems and issues. The quality of their results depends on the extent to which individuals' knowledge can flow among intelligent agents (Halper, 2019). Regarding knowledge maps, several models have been expressed in domestic and foreign researches, but so far there has not been a comprehensive model in this regard, despite its increasing importance and is recognized as the main and key component of the knowledge management paradigm. But still suffers from abstraction. The existence of various definitions and descriptions has not yet provided the ground for modeling and finding an operational framework for recognizing the knowledge map in the form of effects and its results to make the organization smarter and solve the problems ahead. Given the importance of knowledge mapping in the process of organizational intelligence, this study seeks to answer the question " what is the comprehensive model of smart organizational knowledge mapping with a hybrid approach based on transnationalism?"

2. Literature Review
2.1. Knowledge map in smart organizations
A knowledge map is a communication medium that is designed for a

specific purpose and uses the graphic representation of texts, models, figures, or symbols to create communication between its creators and its users. The knowledge map is a guide, not a repository of knowledge; Because it refers to knowledge but does not contain its content. Creating a knowledge map is determining the location of important knowledge in the organization and publishing a list or image that indicates the location of that knowledge. Knowledge maps, while referring to documents and databases, also introduce knowledge holders (Choi et al., 2008).

A knowledge map is an open interactive system for dialogue that defines, organizes, and sets up sensory, structured, and applied knowledge related to problem-solving. A knowledge map is a knowledge management tool through which the users of the organization are given information about the location of knowledge and knowledge base, including knowledge holders, documents and resources, and databases. The knowledge map identifies the specialties and knowledge required by individuals by their location in the organization (Schumann & Tittmann, 2015).

A knowledge map is a set of lists, graphical maps of knowledge carriers, knowledge locations, knowledge resources, knowledge structures, or knowledge users that enable individuals to identify knowledge, knowledge location, knowledge structure, and knowledge application. A knowledge map is a visual representation of recorded information that helps observers with different backgrounds and levels of knowledge to make optimal use of this information and understand the relationship between them. A knowledge map considers explicit and implicit knowledge, and how it flows in the organization. The knowledge map depicts the resources, flows, constraints, and expiration of knowledge within the organization (Wang, 2017).

Each of these definitions emphasizes some of the features of the knowledge map; Therefore, they may be different from each other, but what can be understood from all these definitions is that the knowledge map shows what knowledge each employee of the organization has and the holder of that specific knowledge in the organization. A knowledge map is a guide tool for finding knowledge resources and knowledge contained in the organization and is not merely aimed at identifying tangible and tangible assets; It also shows the tacit knowledge hidden in the minds of individuals and organizational processes. A knowledge map may bring back to mind

the concept and function of the organizational chart, but it should be noted that although an organizational chart is a useful tool for early identification of organizational knowledge, it will be a poor alternative to a knowledge map (Li, 2016).

Creating a knowledge map means finding the place of valuable knowledge in the organization and publishing a kind of list or image that shows them. Knowledge map refers to the books and documents containing knowledge, scientists, and knowledge holders. The question that arises is how to draw a knowledge map. Knowledge mapping helps to discover the position, ownership, value, and utilization of knowledge achievements. This helps planning to reveal tacit information and knowledge and show the importance and connection between dynamic science and knowledge resources (Erceg & Zoranovic, 2022).

The patterns of managerial work have been influenced by the advent of new communication technologies, and the power of knowledge is now essentially an organizational asset. Information and communication technologies are inherently powerful mechanisms in the transmission of information, and this makes possible the acquisition of knowledge. Information technology has had a great impact on industrial development. For example, information technology is responsible for automating routine tasks and coordinating many activities through better communication. In many organizations, it is essential to consider comprehensive computer systems, related databases, and their applications to analyze and understand their core business processes. Computer systems are primarily involved in human activities and automatically control a variety of processes. The terms in these systems are also useful for measuring and monitoring to ensure better quality and cost control (Zhao, 2013).

3. Method
3.1. Meta-Synthesis
A meta-synthesis is a qualitative study that examines the information and findings of other qualitative studies related to a similar topic. As a result, the sample for the meta-synthesis of selected qualitative studies is formed based on their relationship with the research question. Beyond an integrated review of the qualitative literature there is not the subject. Also, secondary data analysis and primary data are not

selected from studies; Rather, it analyzes the findings of these studies. By providing a systematic approach for researchers and by combining different qualitative research, meta-synthesis explores new and fundamental topics and metaphors, thereby enhancing current knowledge and creating a comprehensive view of the issues.

Hypertext requires the researcher to conduct a thorough and in-depth review and combine the findings of related qualitative research. In the meta-synthesis method, the researcher combines the secondary data of the results of other studies to respond to the results of his study and obtains new results.

3.2. Meta-ethnography

Transnational ethnography is one of the interpretive methods in combining qualitative studies and by determining phrases, keywords, and metaphors, instead of summarizing the results, the ideas in the studies interpret them and determine the relationship between the studies. The number of studies that can be examined is small and it pays attention to the meaning in the context. This type of research includes the interpretive qualitative and social and theoretical context in which the main findings appear in that context and tries to improve this context and compare it. In this method, after selecting related studies, a list of keywords, concepts, and keywords is extracted. The researcher then judges the similarities and contradictions and their relationships from different aspects. This approach has seven steps.

Sandelowski & Barroso (2003) believe that meta-ethnography is a meta-study and a distinct measure of studies focused on the composition of qualitative research. Many experts and qualitative researchers agree that meta-ethnography is the most common and important methodology for combining the results of qualitative research.

Noblit & Hare (1988) argue that transnationalism is used for a wide range of topics and studies that are relatively heterogeneous.

1- The first step is to determine the title of the research. The title should be in the field of work of the researcher and should be of sufficient value to do more than one combination.

2- The second step is to select eligible studies to enter the meta-analysis. At this stage, the criteria for entering and leaving the study are determined.

3- In the third stage, the selected studies are reviewed to discover

key concepts.

4- In the fourth stage, the researcher examines the relationship between the studies. Studies can be contradictory and to some extent related to each other.

5. Studies are translated into each other.

6. The researcher creates a whole corpus from the initial studies.

7- The result of trans-ethnicism is published in the form of reports in publications.

Doyle (2003) argues that transnationalism is a dynamic, inductive, interpretive, and everyday approach to many interpretive and creative analyzes, including transnational analysis, symbolic interaction, naturalistic, qualitative, constructivist, and hermeneutic, and includes phenomenology. He describes transnational ethics from four dimensions: purpose, data sources, data collection process, and results, which are listed in the table below.

Table 1: Dimensions and characteristics of meta-ethnography (Doyle, 2003).

Methodological approach	Property
Target	Re-conceptualization of concepts with the aim of playing a greater role and contribution in human discourses
Data sources	Findings and interpretations of existing case studies
Data collection process	Unlikely and purposeful sampling on the construction of interpretations, images and claims
Result	Interpretations among case studies

In the figure, the effective factors on the qualitative evaluation of studies are also identified including practical choices, resources from which studies have been obtained.
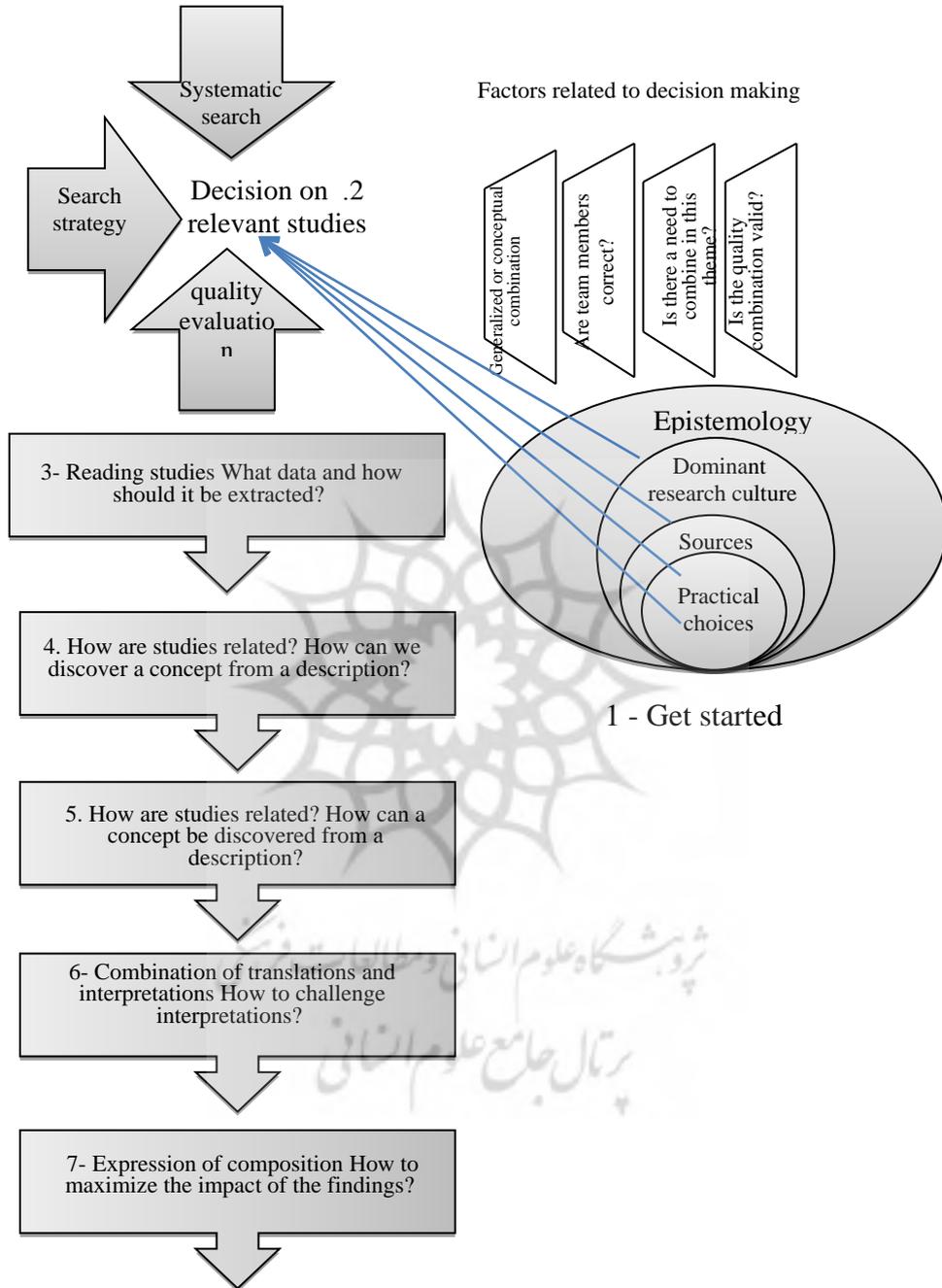
Systematic search

Factors related to decision making

Search strategy

Decision on .2 relevant studies

quality evaluation

Generalized or conceptual combination

Are team members correct?

Is there a need to combine in this theme?

Is the quality combination valid?

3- Reading studies What data and how should it be extracted?

Epistemology

Dominant research culture

Sources

Practical choices

4. How are studies related? How can we discover a concept from a description?

1 - Get started

5. How are studies related? How can a concept be discovered from a description?

6- Combination of translations and interpretations How to challenge interpretations?

7- Expression of composition How to maximize the impact of the findings?

Figure 1: The concept of meta ethnography

Setting the purpose of the study

Various dimensions are used to formulate the research question, such as the study population, what, when, and how the method is performed. An appropriate question in meta-composition can examine a particular phenomenon, its dimensions, and consequences, and the factors affecting it.

Table 2. Research questions

Parameter	Research question
what	What are the different models of knowledge mapping and what are the factors of each?
How	What are the similarities and differences between these models and how are they combined?

The keywords searched in this research are as Table 2.

Table 3: Search terms

Keywords in Persian and English
Knowledge map
Knowledge gap
Knowledge Tree

A systematic review of the literature

By reviewing and identifying research through the National Library Search System and other libraries, research institutes, and sites such as Science Direct, Google Scholar, Springer, Emerald, Researchgate, World scientific, etc. with keywords related to knowledge map model indicators for the smart organization in the field Title 26 found. At this stage, the researcher deletes several articles in each review, which are not reviewed in the meta-synthesis process. The review and selection process in this study are summarized in Figure 2:
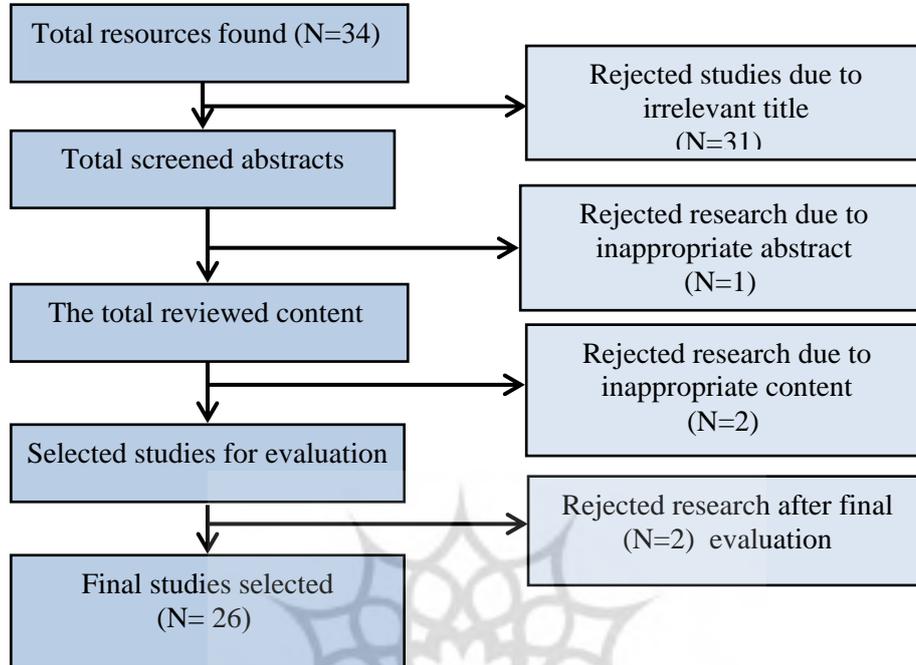
Figure 2. Review and selection process

Accordingly, 34 articles were evaluated based on ten criteria. The result of structural and content analysis of articles showed the approval of 34 articles. After 4 stages of refinement, out of 34 studies, 8 were excluded, and 26 studies were selected for data analysis.

Examining the models and processes of knowledge mapping
In this section, different models and methodologies of knowledge mapping are expressed according to the different perspectives that exist in this field, and the steps proposed by researchers in the models and processes of knowledge mapping are examined. Table 4 shows the steps in the knowledge mapping process from the perspective of researchers in this field of knowledge.

Table 4: Models and processes of knowledge mapping

Researcher	Sequence of steps in the model
Weall (1999)	1- Identifying sponsors and their goals, 2- Determining the scope of knowledge map and users' needs, 3- Starting continuous training in relation to the requirements of knowledge map drawing, 4- Identifying key stakeholders

	affected by creating knowledge map, 5- Creating knowledge map steering committee With direct representatives of sponsors, stakeholders and key members of the technical committee, 6- Creating a technical committee to draw the role of knowledge, 7- Developing evaluation tools and the process of selecting knowledge map capabilities, 8- Identifying the person in charge of knowledge and knowledge storage process, 9- Creating knowledge map Initial organization and get feedback
Davenport and Prosak (2000)	1- Creating a framework for determining the level of knowledge, 2- Determining the required knowledge, 3. Determining the amount and type of expertise and knowledge of individuals, 4- Visualizing specialists and their knowledge, 5- Creating a connection between maps and educational programs.
appler (2001)	1- Identifying knowledge-based processes, 2- Identifying knowledge assets, 3- Compiling and coding knowledge components, 4- Integrating knowledge components in illustrated interfaces, 5- Updating knowledge maps.
Pei & Wang (2005)	1- Determining parts and areas of knowledge, 2- Extracting and determining knowledge components, 3- Creating current knowledge structure in processes, 4- Creating knowledge connections in illustrated interfaces, 5- Validating knowledge map.
kimoo et al. (2006)	1- Defining organizational knowledge using ontology, 2- Mapping, 3- Extracting knowledge from processes, 4- Creating profiles for the extracted knowledge, 5- Creating knowledge connections in illustrated interfaces, 6- Validating knowledge maps
Helster and Hosted (2008)	1- Determining knowledge-based processes, 2- Determining knowledge assets, 3- Compiling and coding knowledge components, 4- Creating illustrated interfaces for display, 4- Determining the process of updating knowledge map.
Liu, Li et al. (2010)	1- Determining knowledge goals and users of knowledge map, 2- Extracting current knowledge in sections, 3- Compiling and coding knowledge components, 4- Creating database and knowledge, 5- Creating illustrated interfaces for display.
Eleven-step method (Bargent, 2002)	1- Identifying requirements 2- Auditing information, 3- Defining information sources for use, 4- Modifying word-based lists, 5- Configuration, 6- Creating people profiles, 7- Setting data for spinning, 8- Creating a map, 9- Knowledge map training, 10- Creating dependencies, 11- Knowledge map review
Four-phase method (Lecocq, 2006)	Phase One: Planning Phase Two: Collecting Phase Three: Map Phase Four: Accreditation and Application

The three-step method (Mansingh et al., 2009)	1 Development of ontology in the field of knowledge through feasibility, refinement and evaluation. 2- Creating a knowledge map using standards and flowcharts or Petri nets. 3. Extract the knowledge map by giving examples of ontology and making connections between concepts.
The nine-step method) Zhao et al. , 2013)	-1 Awareness of textual information. -2 Obtaining job information. -3 Obtain product structure. 4. Transfer background information to knowledge needs. -5 Creating knowledge demand features and description of knowledge retrieval. -6 Knowledge retrieval and categorization. 7. Select the goal of knowledge. 8- Determining the relevant type and visual dimension. 9- Drawing a map from different aspects..
American Center for Productivity and Quality (2005)	1- Identifying the main processes of different departments, 2- Identifying the users of the knowledge map, 3- Drawing the identified processes, 4- Identifying the knowledge required by the processes, 5- Formulating the process of collecting, validating, storing and sharing knowledge, 6- Analyzing the prepared knowledge map based On drawing processes, 7- Identifying existing knowledge gaps and knowledge communications, 8- Determining the validation criteria of mapping processes.
Bater (2005)	1- Identifying the goals, scope and stakeholders of mapping, 2- Determining the knowledge team of mapping, 3- Determining approaches for mapping, 2. Identifying different parts and areas of knowledge, 4- Formulating knowledge terms for integration, 5- Formulating Knowledge terms for integration, 6- Determining techniques and tools for compiling knowledge maps, 7- Validating and reviewing knowledge maps.
Lecocq (2006)	1- Determining the main processes and required activities, 2- Determining the necessary roles for the activities Specified, 3- Identifying the explicit knowledge required to play the roles, 4- Extracting tacit knowledge from specialists to play the roles, 5- Creating knowledge profiles and coding it.
Ebener et al. (2006)	1- Obtaining raw data from different sources, 2- Preparing and modifying raw data through their analysis, 3- Storing the obtained data in a central database, 4- Processing the resulting data, including analyzing and aggregating them, 2- Visualization of processed data.
Lin and Hsueh (2006)	1- Determining the domains, knowledge sections and their knowledge components, 2- Identifying the connections between knowledge components, 3- Determining the knowledge flows in the departments, 4- Visualizing the connections and knowledge flows in a knowledge network, 5- Validating and checking the accuracy of the knowledge map .
Driessen et al. (2007)	1- Determining all knowledge assets and knowledge-based components, 2- Creating a connection between knowledge-

	based components and knowledge assets, 3- Creating a suitable visual interface to display communications.
Yang (2007)	1- Creating and determining a framework for knowledge and different fields of knowledge, 2- Determining the sources of knowledge to be analyzed, 3- Extracting knowledge from designated knowledge sources, 4- Combining and compiling knowledge extracted from knowledge sources, 5- Showing a picture of Extracted and codified knowledge in a visual interface, 6- Interpretation and evaluation of illustrated knowledge in the compiled knowledge map.
Seitan (2009)	1- Identifying current processes in departments, 2- Identifying knowledge needs of different departments, 3- Auditing knowledge to evaluate and determine knowledge assets, 4- Determining knowledge resources and specialists appropriate to departments, 5- Illustration of processes along with allocated knowledge and knowledge resources .
Yasin & Egbu (2011)	1- Determining organizational knowledge through the processes of acquiring knowledge from knowledge sources, 2- Analyzing knowledge in different fields and identifying knowledge gaps, 4- Establishing knowledge connections and displaying the relationships in the illustrated interface.
Rao et al. (2012)	1- Identifying and analyzing different knowledge departments and processes in it, 2- Determining knowledge flows in departments based on the existing processes in it, 3- Identifying knowledge sources and specialists, 4- Extracting knowledge from specialists and experts, 5- Creating profiles For the extracted knowledge, 6- Creating existing knowledge connections through knowledge profiles, 7- Integrating communication and knowledge flows in an illustrated interface, 8- Validating and updating the knowledge map.
Chung et al. (2012)	1- Selecting and identifying the desired knowledge field, 2- Identifying concepts, ideas and knowledge components of each knowledge field, 3- Creating a basic knowledge map by establishing knowledge connections and connections, 4- Reviewing the concepts and communications illustrated in the knowledge map, 5- Modifying Concepts and knowledge communication according to the level of knowledge map users, 6- Creating the final list of concepts, knowledge components and type of knowledge communication, 7- Creating the final knowledge map based on approved concepts and communication.
Akhavan & Pezeshkan (2013)	1- Examining the business strategies of the organization and determining the types of knowledge and fields of knowledge required to realize these strategies at different levels, 2- Identifying the resources of the organization in each field of knowledge, 3- Classifying different fields of knowledge based

	on the type of knowledge and level required, 4- Compiling a map Knowledge resources of the organization based on the allocation of people and existing expertise to the fields of knowledge required by the organization, 5- Creating an illustrated interface in the form of a matrix to display a map of knowledge resources, 6- Creating an illustrated interface in the form of a matrix to display a map of knowledge resources.
Hao et al. (2014)	1- Selecting the desired knowledge field, 2- Extracting key words from the knowledge components of the knowledge field based on the knowledge base of that field using text mining method, 3- Forming the matrix of key words in the knowledge components of the knowledge field, 4- Determining the degree of similarity and semantic matching Between the knowledge components of the field based on the importance and repetition of keywords, 5- Determining the relationship between the knowledge components of the field based on semantic similarity and conformity, 6- Forming a knowledge graph including knowledge components and relationships between these components in the form of groups and links. Display the knowledge structure map in that field, 7- Classify the knowledge components based on their relationships under different knowledge domains and display it in the knowledge structure map.
Armando (2015)	1- Collecting and retrieving information related to the desired field of knowledge using advanced search method, 2- Creating a list of key terms and words related to the field of knowledge, 3- Determining different knowledge fields in the desired field of knowledge, 4- Assigning each Key term to a knowledge field in the field of knowledge, 5- Determining the degree of communication of key words in each field of knowledge using social network analysis technique, 6- Classification of knowledge fields based on the average degree of communication in it, 7- Illustration and Drawing a chart of knowledge fields, to show the knowledge development map in the desired field of knowledge.
Najafi et al. (2017)	1- Data extraction, 2- Definition of analysis units, 3- Selection of index, 4- Calculation of similarities between units, 5- Classification, 6- Use of visual results for analysis and interpretation of data.

Identification of the basic components in developing a knowledge map

As it was observed, based on the content analysis, 26 articles were obtained by autograph or transnational method. Regarding knowledge map patterns, several patterns have been expressed in domestic and

foreign researches, but so far there is no comprehensive model in this regard. The models presented by the researchers show that some steps are very important for compiling a knowledge map and in most studies these steps have been repeated so that they are used more frequently in the process of making a knowledge map by these researchers has taken. The coding validity was checked using kappa coefficient. The kappa value was 0.87, which was confirmed. These steps are listed as the basic components of knowledge mapping:

- Identifying organizational measures and goals required to develop a knowledge map;
- Collect information from organizational resources
- Determining users of knowledge map and their knowledge requirements;
- Determining the scope of the knowledge map to draw it;
- Identification of organizational processes, knowledge communication, and the necessary competencies to implement the processes;
- Determining the existing knowledge areas in the organization;
- Identifying and auditing existing knowledge in the organization;
- Creating knowledge profiles for knowledge extracted in various fields and processes;
- Identifying knowledge connections and integrate them into the knowledge map using visualization;
- Validation of knowledge map after initial compilation;
- Updating knowledge map continuously

Table 5: An example of extracting and applying the steps of the knowledge map

level	Armando (2015)	Hao et al. (2014)	Akhavan & Pezeshkan (2013)	Chung et al. (2012)	Rao et al. (2012)	Yasin & Egbu (2011)	Seitan (2009)	Yang (2007)	Driessen et al. (2007)	Lin and Hsueh (2006)	Ebener et al. (2006)	Pei & Wang (2005)
Identifying required actions	✓	✓	✓	✓	✓	✘	✓	✓	✓	✘	✓	✘

level	Armando (2015)	Hao et al. (2014)	Akhavan & Pezeshkan (2013)	Chung et al. (2012)	Rao et al. (2012)	Yasin & Egbu (2011)	Seitan (2009)	Yang (2007)	Driessen et al. (2007)	Lin and Hsueh (2006)	Ebener et al. (2006)	Pei & Wang (2005)
Gathering information from organizational resources	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓
Extracting knowledge areas and key activities of the organization	✓	✓	✗	✗	✓	✗	✓	✗	✓	✓	✓	✓
Preparation of concept map and profiling	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✗
Review and final approval of the map	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗
Converting concept map to knowledge map	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interviews with experts and validation	✓	✓	✗	✓	✗	✗	✓	✓	✗	✓	✓	✗
Maintaining and updating the template	✓	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✗
Common steps	3	4	4	5	4	4	5	5	4	5	4	3

Developing a proposed knowledge map model
In this section, a model for compiling a knowledge map is presented. The basis of this proposed model is to pay attention to knowledge disclosure, knowledge resources, and knowledge flow in these processes to develop networking activities inside and outside these centers.

The proposed model of eleven basic steps, respectively: determining the knowledge objectives of these centers by compiling knowledge maps and identifying users of knowledge maps, identifying definitions and terms of knowledge and specialized growth centers, identifying the basic processes of these centers, and drawing and analyzing process maps, extracting knowledge from The activities

in the processes of smart organizations are based on the process map, creating a profile for the extracted knowledge, creating knowledge connections and connections and integrating these connections in an illustrated interface and finally validating the developed knowledge map. Figure 3 shows the steps of the proposed model for creating a knowledge map of science and technology growth centers. In the following, each of these steps is described in order. The model is based on artificial intelligence techniques, genetic algorithms and neural networks.
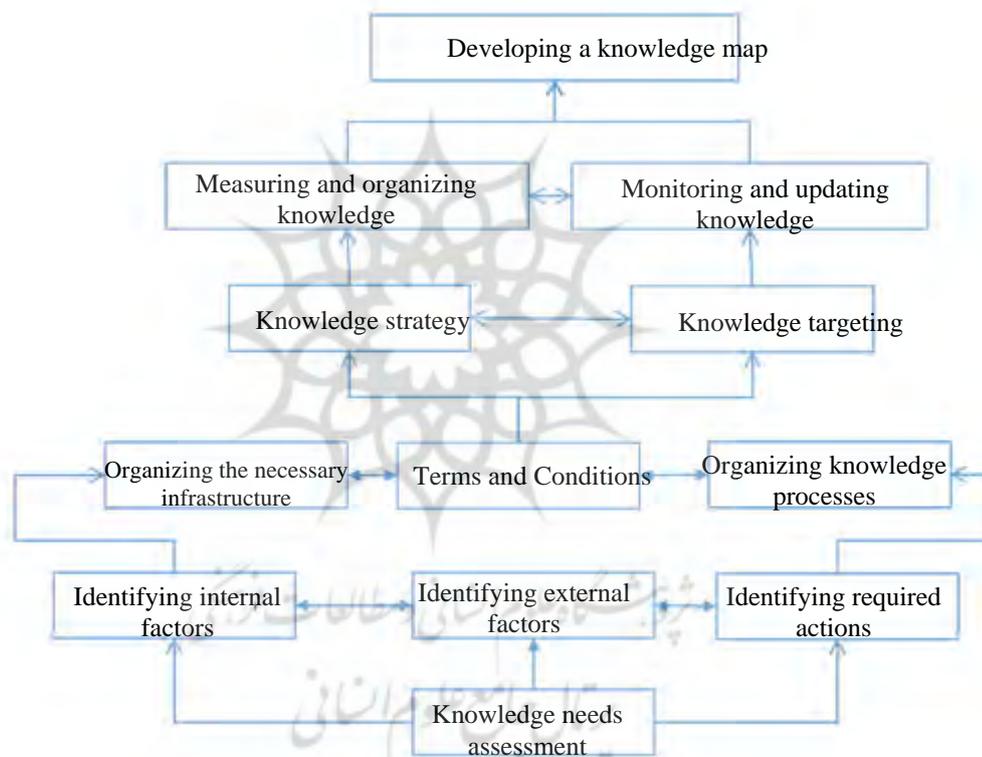

Figure 3: Comprehensive proposed model for intelligent /smart organizational knowledge mapping

1. Knowledge strategy
In this stage, we talked about the strategy and goals of organizational knowledge and the relationship between organizational knowledge and business strategies and identifying solutions to eliminate the

knowledge gap, as well as the level of senior management support for project implementation and knowledge map architecture and identifying business values. Becomes.

2- Identifying the required measures

At this stage, the required actions including identified activities and processes, and tasks as well as processes such as change management and process re-engineering and project management document management, and information quality management of knowledge/information are examined.

3- Identifying external factors

At this stage, external factors such as modeling different topics or keeping pace with global knowledge and changing the competitive environment are examined, and in this regard, the evaluation of the environment and external needs are examined and feasibility.

4- Identifying internal factors

Finding internal factors affect the organization's vision and mission. Identify factors that may change in the future. Utilize strengths or weaknesses better than competitors. Internal factors such as organizational processes, carte blanche, organizational communication, knowledge training, motivation and reward, expert associations, organization of necessary structures, organizational structure, and processes, and information technology/security knowledge extraction systems are also examined and identified.

5- Organizational structure and processes

In this stage, information technology/knowledge extraction systems to draw a knowledge map, review organizational structure and processes such as security, information technology management, training and learning, organizational culture, educational and knowledge management procedures, financial and time resources, rules and regulations Organizational, Measuring and Organizing Knowledge Evaluation Performance Evaluation Knowledge Extraction Evaluation Satisfaction of Applied Knowledge

6- Monitoring and updating

At this stage, we have the use of social software (smart site,

messenger, knowledge management software), information and communication technology (Internet, software, and hardware appropriate to the type of company), semantic web technology infrastructure (virtual discussion), types of social network subscriptions), knowledge management systems, the ability to use new technology in data analysis, the use of artificial intelligence and, the use of data mining.

7- Organizing knowledge processes

By identifying organizational processes, it is possible to identify the existing knowledge in the organization;

Because the implementation of these processes requires special knowledge components. Also, by identifying organizational processes and paying attention to the flow of knowledge to perform them, we can understand the knowledge gaps and incorrect procedures of the organization in terms of knowledge and can correct them.

To perform any process or activity, special competencies such as skills, expertise, training, and abilities are required, which must be identified by the people of the organization to be used in a suitable place as a source of knowledge for the organization. At this stage, factors such as types of knowledge (specialized, practical, qualitative, general, and management of various types of knowledge, etc.) knowledge management processes (knowledge planning, knowledge acquisition, knowledge organization, knowledge retrieval, knowledge application, knowledge retention, Knowledge evaluation) The dimensions of knowledge (tracking, representation, flow, map, audit, ontology, classification, clustering, etc.) are examined and identified.

8- Targeting knowledge

The knowledge goals of the organization to develop a knowledge map should be determined and its users be identified One of the most important knowledge goals of organizations is to develop a knowledge map, that can continuously improve effectiveness and efficiency by revealing knowledge, knowledge resources and knowledge flows in these processes, continuously increase competitiveness through improvement and Quantitative and qualitative improvement of processes related to high value-added general and specialized support services, enhancing competitiveness and accountability of growth centers by improving and modifying knowledge flows related to

demand-based service, accelerating response speed in flexibility in decision making , observing the rules of using smart knowledge in decision making (dynamics), creativity and innovation

9- Preparing a knowledge map

In this section, we take into account the influential factors that were described in the previous section about the compilation of the knowledge map and also pay attention to the type of knowledge map determined based on different criteria, we formulate approaches, and we determine the desired technique for compiling knowledge map to provide a model for compiling knowledge map Paid.

10. Knowledge needs assessment

Identifying these terms and knowledge terms and their characteristics and context to provide a comprehensive and common representation of these terms and terms of knowledge is important, and in compiling a comprehensive and efficient knowledge map it is necessary to determine the sections and areas of knowledge. Identify weaknesses and threats. Classify strengths and opportunities. Create current knowledge structure in processes. Establish knowledge connections in the illustrated interface of polls and brainstorm on the role of knowledge.

Discussion and conclusion

Among the knowledge management tools, knowledge maps due to being in contact with human resources and experts in the organization in the process of acquiring knowledge from them and using IT infrastructure to visualize and display the map and create a user-friendly technology-based relationship to use it. In the organization, it is in a combination of human-centered and technology-oriented. Also, if we consider the key processes of knowledge management as the processes of knowledge identification, knowledge creation, knowledge storage, knowledge sharing, knowledge application and knowledge evaluation, each of the knowledge management tools can be used in the realization of one or a set of these processes. Meanwhile, a knowledge map due to the flexibility in goal setting, formulating it based on the needs and goals of the organization and also covering a wide range of expertise and knowledge assets of the organization, if compiled comprehensively and completely in the

organization, plays an important role in achieving all these processes.

In this study, by a complete and comprehensive review of knowledge maps of the organization as one of the basic and operational tools of knowledge management, for the first time, a model consisting of eleven steps to develop a knowledge map according to the characteristics has been presented. By examining and categorizing the types of knowledge mapping patterns using a combination of hybridization and meta-ethnicity, 26 patterns have been identified, and by combining these models , and by comparing their similarities and differences, the final model of knowledge mapping has been presented. Information technology enables the dissemination and concentration of knowledge, enables top-level managers to obtain information more quickly and accurately, and also enables middle-level managers to be more informed and to make timely decisions. Existing IT infrastructures support knowledge management architecture. Information technology infrastructures make it possible to collect, define, store, index, and link data and digital objects for processing to obtain information with sufficient flexibility and to use this information to improve activities and support decisions (Armando, 2015) Managers who used it well. Adamczewski et al. (2021) showed that knowledge can purposefully plan the intelligence of the organization. Ross (2018) . They also state that organizational intelligence requires knowledge and the use of knowledge requires digital tools.

The model presented in this research in terms of the implementation of the designed knowledge map has many benefits for the smart organization, but still the issue of adequate support of managers and the belief in added value created in organizational processes by developing a knowledge map due to quantitative difficulty. Creating value creation is a challenge in this area. This paper argues that a set of factors identified in the knowledge map are dramatically useful in explaining the relationship between knowledge efficiency, intelligent factors, and technical resources. Operational relationships should be emphasized, as they strengthen knowledge management. However, the behavior of each intelligent agent depends on the management actions and motivational methods that the organization adopts. In this architecture, technical tools and intelligent factors can help develop knowledge decisions based on reliable design methods that involve prediction. Based on the designed model, it is

suggested that knowledge needs assessment be conducted in the organization consecutively and data mining systems in the organization be established.

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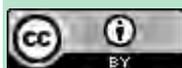
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