

# Best Practices on the Integration of Usability at the Organizational Level: A Review

Carmen Carvajal, PhD<sup>1</sup>, Ana Moreno, PhD<sup>2</sup>, and Idalides Vergara-Laurens, PhD<sup>3</sup>  
<sup>1,3</sup> Universidad Ana G. Méndez, Puerto Rico, carvajal1@uagm.edu, ivergara@uagm.edu  
<sup>2</sup> Universidad Politécnica de Madrid, España, ammoreno@fi.upm.es

**Abstract**—This article analyzes existing practices or guides in the literature for software organizations to improve the usability of their applications. The selected research method is the synthesis of qualitative data through a thematic synthesis. In this research, different recommendations were recovered to achieve the incorporation of usability at the organizational level, mainly derived from case studies. As a result, 13 topics grouped into 5 higher order topics have been obtained. These topics summarize the important and necessary aspects, to not only achieve usable software projects as a result, but to that usability is present as part of the essence of the organization. One of the main contributions of this work is the model of interrelation between the themes identified in this work. This model presents the existing knowledge in the literature on good practices to integrate usability at the corporate level.

**Index Terms**—Usability, thematic synthesis, maturity models, usability taxonomy.

## I. INTRODUCTION

This article focuses on perform an analysis of existing practices or guides in the literature for software organizations to improve the usability of their applications. The selected research method is the synthesis of qualitative data.

There are different methods for synthesizing qualitative data. The range of methods has increased lately due to the interest in performing qualitative synthesis to obtain information on new policies and practices in different areas such as health or psychology [1] and recently Software Engineering [2]. The work titled as "Methods for the synthesis of qualitative research: a critical review", presented in [1], identifies and describes each of the existing methods to help researchers select the most relevant qualitative analysis method. In this study, nine different methods are identified to perform qualitative data synthesis, such as meta-study, meta-ethnography, textual narrative synthesis or thematic synthesis. Thematic synthesis is the method that best suits this study since it clearly establishes that the iteration is performed at the synthesis stage. In addition, it establishes the quality evaluation of the collected studies, and establishes the methodology for the description of the primary data and the generation of the interpretation of the phenomenon. Similarly, according to Cruzes et. al. [2], thematic synthesis allows organizing and combining the findings from a diverse set of sources. Additionally, it allows handling qualitative and quantitative data in an inductive or deductive way [2]. Finally, according to Barnett-Page et. al. [1], the product of the thematic synthesis

takes the form of practical recommendations for interventions, which is important for the study of usability. This article defines the selected methodology to perform the thematic synthesis. Also, the steps taken to carry out the synthesis in this study are detailed. Finally, the results of the thematic synthesis carried out are presented.

## II. RESEARCH METHODOLOGY

The main objective of this study is to explain how usability integration is implemented at the organizational level. For this, a set of studies was compiled that present practices, recommendations, lessons learned and principles related to the integration of usability at the organizational level. The research question posed focuses on how usability integration is put into practice at the organizational level through the identification of practices, recommendations, lessons learned, and principles that have been studied in the retrieved literature.

The research question is: *What are the practices, recommendations, lessons learned and principles used in organizations where there is software development to integrate usability from the organizational point of view?*. In order to answer such question, the thematic synthesis performed as part of this work follows the steps and recommendations dictated for Software Engineering defined by [2]: The first step consists of the initial reading of the articles retrieved according to the research questions to extract the information from the source, such as bibliographic information, contexts and findings. In addition, in this step the text segments that are related to the answers to the research questions are selected. The second step, based on the text segments, the researcher identifies and defines possible codes. Once a comprehensive and inclusive review of the codes has been carried out, themes based on the studies and research questions will be identified. Once the topics are defined, the relationships between them are analyzed and a model is created with the relationships between topics. Finally, the reliability of the interpretations made in the thematic synthesis is evaluated.

Based on the research question, a set of keywords were defined to search with the terms "usability" and "organizational". In addition, words related to the term usability such as: "human centered design", "user centered design" and "user experience" were taken into consideration as well as terms related to "organizational" such as "organization", "management" and "governance".

The search was conducted in the last quarter of 2022. Electronic databases and conferences from the software development area with content on the web were used. The electronic

databases used were ScienceDirect, the ACM digital library, IEEEExplore, and Springer Link. Also, Google Scholar (GS) was used as a secondary search engine to retrieve information of interest. In addition, after applying the inclusion/exclusion criteria, the backward chain sampling technique (backward snowballing) was performed on the selected articles. As a result of the article identification process, 44 articles strictly complied with the objectives of this work.

### III. THEMATIC SYNTHESIS

One important objective of this work is the identification of practices that help to incorporate usability at a corporate level in a software development company. Since the primary studies retrieved are of various types of research, such as evaluation, experience, and expert opinion, the use of thematic synthesis is an advantage since, according to Pope et. al. [3], it provides a way to organize and combine the findings of great importance. and various knowledge bases. The synthesis carried out as part of this thesis follows the steps and recommendations dictated for Software Engineering defined by Cruzes et. al. [2] presented in section II. For the first step, which is the extraction of text segments, each article was read one by one and as the reading progressed, the relevant text segments in each article were highlighted. It is important to note that each article was read several times in order to confirm the relevance of the highlighted segments, add segments that had not been specified in previous readings, or eliminate irrelevant segments. Therefore, 228 segments were extracted, after several readings 127 extracted segments were obtained.

#### A. Generation of codes

The second step in a thematic synthesis is the generation of codes. The codes refer to labels, selected according to the research question, that describe text segments of interest to the researcher in each of the studies. The coding process consists of examining and organizing the information from each study, identifying one or more passages in the text that refer to the same idea or concept. The selected studies were carefully read and the different relevant text segments were coded according to the research question. It is important to mention that the tables and figures are also part of the information to be extracted. The analysis was based on an iterative process that involved reading the primary sources, coding, revision, and updating of the coding. This is a recommended process when perform thematic synthesis in order establish a clear relationship between the text and the coding [4]. Then, a name was assigned to each code that arose from the practices, principles, recommendations, and ideas in the primary articles. For this research, the inductive method was followed, in which the codes were defined as the 127 text segments extracted in the first step of the thematic synthesis were reviewed. Initially, those segments were tagged with 35 codes; and after successive iterations, 31 codes were obtained to label the text segments extracted from the selected articles. In these iterations the original codes were combined, in the cases in which there were similarities between them, or they were divided into new codes, in the cases in which the original codes were very broad.

#### B. Generation of topics

Once the codes were defined, the topics were defined according to Cruzes et. al. [2]. Topics help to synthesize a certain amount of code into a smaller number of concepts called topics. For this, an inductive reasoning process was carried out in which the topic emerge through a meticulous analysis and their constant comparison, grouping the codes that share similar characteristics. Usually, a successful coding and categorization are not achieve at the first try. After an iterative process of analysis, 13 topics were finally defined as described in Table I. This table shows the name of each theme followed by a description and the publications where it is discussed.

1) *Usability goals at the organizational level:* This topic is related to the recommendations and practices exposed in various articles on the usefulness of defining usability goals at the corporate level as well as integrating it with other corporate processes. Among the articles that address this issue are presented at [5], [6] and [7]. Cajander et al. [7], state in their study that the success of a usability integration program depends on whether it is aligned with the goals of the organization. Bloomer et. al. [8] state that to make allies throughout the organization, it is important to demonstrate how usability will help other areas of the organization to achieve their goals. To do this, it is necessary to develop corporate usability goals that are aligned with organizational goals and show how usability goals help to achieve them. In the same way Venturi et al. [9] suggest the use of corporate goals and also suggest providing incentives to those who achieve those usability goals.

2) *Definition of a usability process at the corporate level:* This topic arises as a result of identifying codes related to the need to define a formal process to integrate usability in the organization. Among other articles [10], [11] and [12] address this issue. For example, it is stated that User Experience - UX leaders must create an organizational model that supports the integration of UX in the organization.

Furthermore, Gulliksen et al. [12] propose that this process should be adapted according to the organization. As part of the process it can be identified, according to Lanzilotti et al. [13] and Ardito et al. [14], the inclusion of usability requirements as part of general software requirements.

3) *Usability evaluation:* Some articles argue about the importance of evaluating the maturity of usability in the organization. The usability maturity assessment measures how usability is planned and implemented in the organization, and as a result of the assessment, the organization can identify areas for improvement in this area. As part of this maturity assessment, for example, the integration of usability throughout the entire software development cycle is evaluated.

Komischke [15] presents a study on an analysis of practices of other companies and her experience in a case study in her company to establish UX practices. In this study, she argues that a first step to implement usability is to assess its maturity. Sharma [16] as part of the article based on a case study on the institutionalization of usability in the banking industry also highlights the need for a constant evaluation of usability at the organizational level. On the other hand, Chapman et al. [6], in

TABLE I  
LIST AND DESCRIPTION OF THE DEFINED TOPICS

Topic	Description	References
Usability goals at the organizational level	It is important to define usability goals at the corporate level in order to measure the impact of usability in the organization and define practices that help meet those goals.	[5], [6], [7], [20], [21], [23], and [36]
Definition of a usability process at the corporate level	A formal usability process must be established at the organizational level in such a way that the usability requirements are part of the software requirements of the different projects. Those requirements must be measurable with a set of metrics that can be applied to software products, and a specific software process that helps satisfy said usability requirements.	[10], [12], [11], [14] and [39].
Usability evaluation	It is important to assess the usability maturity in the organization. The usability maturity assessment measures how usability is planned and implemented, so that areas for improvement in this area can be identified.	[6], [15], [16], [19], [32], and [40].
Key people	To get the necessary resources, it is advisable to get key people, preferably at a managerial level, to support the inclusion of usability in the organization's projects.	[15], [16], [17], [18], and [41].
Resources for usability	Resource allocation for usability is a necessary practice for successful usability integration. These resources can be the hiring of expert personnel, training, technological resources, etc.	[10], [11], [19], [20], [21] and [48].
Usability Evangelism	It is important to publicize the benefits that usability offers to the different departments and the organization itself. Especially, key management personnel to allocate the necessary resources.	[5], [6], [10], [15], [16], [18], [20], [22], [23], [28], [30], [37] and [43].
Calculation of usability benefits	To get the support of management it is necessary to present in a quantified way the costs and benefits of introducing usability in the organization.	[6], [20], [24], [25], [26], [28], and [37].
Usability informally	In a first stage, it is advisable to carry out usability practices in an informal way that show in the short term the benefits of said quality attribute in software projects.	[8], [10], [22], [24], [27], [28], and [42].
Pilot project	To publicize the advantages of usability in a relatively cheap and fast way, the development of a pilot project that applies usability techniques is recommended.	[16], [17], [29], and [30].
Build a usability team	Building a team of usability experts is a key strategy for your integration at the organizational level. This team must be interdisciplinary. The members of this team must be usability evangelists as well as define the usability incorporation plan in the organization.	[11], [15], [18], [31], [32], [33], [35], [41], and [44].
Relevant role to usability	The development process related to usability must be as important as other software activities.	[5], [10], [15], [16], [19], [32], [36], [45], and [47].
Usability manager	It is convenient to select people who act as leaders of the usability integration process. Among their responsibilities should be the constant evaluation of compliance with the goals established for usability.	[12], [16], [21], [24], [27], and [34].
Explicit Management Support	It is necessary to have the support of management to build an adequate infrastructure for the integration of usability in the organization.	[9], [16], [17], [24], [32], [33], [35], [37], [38], and [48].

her study as an expert in the UX area, agrees that a first step in improving user experience design is to understand the level of usability maturity in the organization in order to advance to the next level.

4) *Key people*: As part of the analysis carried out, it was identified that several articles addressed the issue of getting people, preferably at a managerial level, to support the inclusion of usability in projects. For example, there are articles like [15], [17] and [18], among others, in which this topic is discussed.

Rosenbaun et. al. [17] express that it is important to establish alliances, with people from marketing, engineering and corporate management, in the early stages of planning and designing the product. Additionally, Mayhew [18] comments on the importance of having a usability advocate. He also suggests that he be a person with technical and administrative skills to ensure the advancement of usability in the organization. Finally, Komischke [15] in his evaluation study based on a case study in the automobile industry corroborates this category, stating that it is essential to have managerial support to ensure the advancement of usability in the organization.

5) *Resources for usability*: In some of the articles retrieved, reference is made to the resources allocation to usability as a practice that must be included for its successful integration. Some of these articles are [19], [20], and [11]. The budget to be assigned to usability may be used in different activities or resources depending on the studies retrieved. On the other hand, Duh et al. [21], focus on assigning resources to tools and methodologies that facilitate the work of usability teams.

6) *Usability Evangelism*: Several articles present the practice of educating interested personnel and key management personnel about what usability is and the benefits it offers. On the other hand, in [5] it is stated that identifying the possible benefits of usability is an important argument to promote activities related to it. Among other studies, such as [6], [15] and [18], recommend spending time and effort to communicate the value of usability in the organization. For their part, McCreary et al. [22] offer guides based on the lessons learned from a case study on how to integrate usability at a strategic level in an Information Technology department. One of the guides offered in this study is to evangelize with metrics and data to motivate the use of usability by demonstrating the

impact of usability activities.

Authors such as Mayhew [18] and Bruno et al. [23] highlight the importance of taking the message of evangelization also to the development team, improving knowledge about usability and thus supporting the process of change towards integration at the organizational level. In addition, it is important to carry the usability message to users and management personnel. This is how Bruno et al. [23] affirm that usability evangelization does not stop with users and managers, but must impact other team members to obtain significant benefits. Finally, Lee et al. [26] in his study on lessons for applying usability in fast-paced product development Organizations, states that usability evangelization is vital for the success of its integration into organizational projects.

7) *Calculation of usability benefits:* In some articles the importance of presenting in a quantified way the costs and benefits of introducing usability in the organization is manifested. For example, Chapman et al. [6], in their study based on her opinion as an expert in the area, present the processes that must be carried out to reach the maturity of the user experience in an organization. Prominent among them is the practice of quantifying the benefits of usability. In [20], [24], and [25], they also state the importance of a cost-benefit analysis to get a commitment from management to integrate usability. Along the same lines, in [26] they recommend doing a Return on Investment analysis of usability or an analysis to measure loss of investment to sell usability in management.

8) *Usability informally:* Several articles, including [8], [27], and [28], share the recommendation to perform usability practices informally by introducing usability techniques that directly impact the software or are easily visible. For example, Eriksson [27] reviewed five case studies for introducing usability in public organizations in Sweden, and concluded that it is more successful, in the short term, to directly contribute to software rather than focus on policies and evaluations of existing systems. In addition, Bloomer et al. [8], in their opinion article, state that it is necessary to learn effective ways to communicate the value of usability and for this they advise, among other things, to identify activities that deliver quick results. For their part, in [24] they recommend gradually integrating usability through some predominant tasks in the area; rather than a large-scale process for usability integration. Several articles agree with Donahue [28] in establishing the practice of carrying out usability techniques, even informally, in order to gradually integrate usability and publicize its benefits.

9) *Pilot project:* Several articles, such as [16], [29], and [30], present the implementation of pilot projects as a way to spread the benefits of usability relatively cheaply and quickly. The idea is that in this way their integration into the organization is promoted. In this sense [30], in his opinion article as an expert on the sustainability of User-Centered Design - UCD in organizations in China, he provides recommendations for the integration of usability involving management personnel, developers as well as volunteers passionate about technology. usability. Other articles, in addition to recommending carrying out a pilot, expose strategies to choose the project properly. This is how Rosenbaum et al. [17]

recommend choosing a high-profile project as an effective way to promote usability.

10) *Build a usability team:* Aspects related to an adequate UCD team for the integration of usability in the organization are considered in some studies. Among other articles that address this topic we have [11], [15], [31], [32], and [33] among others. Wong et al. [31], in their study on experience, challenges and lessons learned about promoting the practice of UX. In addition, Komischke, in his study on the analysis of practices of certain companies and their experience on a case study in his company to establish UX practices [15], argues that a multidisciplinary team must be built involving members with diverse experiences in methods and processes to develop UX. Other studies address the relationship that should exist between the UCD team and the rest of the organization, and how their objective should be as a work team. According to Rohn, an expert with more than 20 years of experience in the area, stated that the usability team should support the business goals and also work to gain credibility in the company [11].

11) *Relevant role to usability:* In some articles, emphasis is placed on defining a relevant role for usability and experts in the area as a crucial factor for the integration of usability. In this way, articles such as [5], [19], and [27], argue how the role of usability professionals should be in development projects. These articles define a relevant role for the usability professional in the decisions that involve the project. For example, Gulliksen et. al. [19] suggest assigning the same level of importance within the development process as other professionals would. In addition, Rajanen [5] conclude that for a successful integration of usability, the usability professional must have a relevant and participatory role, but he himself as a professional must adopt that role.

Finally, Komischke states in [15] that incorporating usability throughout the development process is a challenge because due to lack of knowledge, it is sometimes relegated to the last when it is too late to make significant contributions. To mitigate this problem, she presents communication and education at the organizational level about usability practices as a solution.

12) *Usability manager:* One aspect identified in various articles was selecting one or more people to carry the usability flag. These people should act as leaders of the usability integration process according to articles such as [12], [24], and [34]. For example, Duh et. al. [21] and Sward [32] recommend creating a role of a Corporate UX Manager (UX General Manager) [21] or a UX Head (Chief User Experience Officer) at the organizational level. Another approach proposed in several studies is the creation of a Usability Champion role that can be a link between the development team and management as proposed in [27] as well as Gulliksen et al. [12] also propose designating a usability leader. At a more technical level, in [16] argues that usability cannot be improved without integrating it into the culture of product development through collaborative creation, design and solution. The Usability Champion is a role that needs to be identified in each development team. Although, a core usability team with a head of user experience is more effective.

13) *Explicit Management Support:* Authors such as Ferre et al. [24], Aikio [35], Chapman et al. [6] and Venturi et

al. [9] among others, raise the need to have the support of management as a relevant aspect to achieve the integration of usability in the organization, since an adequate infrastructure that demands resources is necessary. On the other hand, Guliksen et al. [48] carried out a survey on usability in different Swedish development organizations, analyzing success factors and obstacles to usability integration. In that article they conclude:

We believe that it is the responsibility of management to make sure that usability is not abandoned or sidestepped in the development projects, or traded off against time and/or money. However, management does not make design decisions and cannot create usable systems/products, these can only be created in projects. Finally, support from project management, upper management and users are crucial, as well as support for usability and user-centred design in the systems development process.

Lutsch [36], in his opinion article, categorically states that without support from the organization, usability will not be successfully integrated. Management support can be used for different purposes, for example Rosenbaum et al. [17] state: In addition, consistent and visible management support at the highest levels of the organizations gave usability greater credibility and perceived importance to overall product and company success in the marketplace. Hoegh-[33] in his article presents a case study of a software development company to integrate usability, as a result he states that management support will be necessary to invest in specialized human resources and laboratory equipment.

### C. Generation of a model of higher order topics

A model with 5 higher order themes was defined in which the 13 previously described themes were organized. These higher-order topics are: management involvement in usability improvement, finding relevant sponsorship, usability communication, short-term usability, and building and supporting a talented usability team.

#### 1) *Involvement of management in improving usability:*

The primary objective in this matter is to obtain the explicit support of management. For this, several articles express recommendations, practices or guides on how the management approach to usability should be. These articles state that it is necessary to establish measurable goals that allow their evaluation. Therefore, a formal usability integration process in the organization is required. In addition, it is necessary to establish the appropriate mechanisms to assess its maturity at the organizational level. This higher order issue includes the following issues: 1- Usability goals at the organizational level; 2- Definition of a usability process at the corporate level; 3 – Usability evaluation; and 13- Explicit support from Management.

2) *Find relevant sponsorship:* This topic is related to the importance of getting the support, in terms of resources and people, to work on this cause, due to the challenges that it entails. Identifying key people who support usability at the managerial level and obtaining resources for its integration are key aspects that must be addressed to achieve its successful

integration at the organizational level. This higher order topic includes the following previously identified topics: 4- Key people; 5- Resources for usability.

3) *Usability communication:* An important issue for the integration of usability at the organizational level is that the members of the organization are motivated and aware of its benefits, preferably in a quantitative way. For this, it is essential to communicate these benefits in the different departments. Several articles address this objective through usability evangelization as a key aspect to achieve its integration at the organizational level. This higher order topic includes the following previously identified topics: 6- Usability Evangelism; 7- Calculation of usability benefits.

4) *Short-term usability:* Formally integrating usability into an organization requires considerable time and resources. However, certain strategies can be defined to show the benefits of usability integration in the short term. One of them is the use of pilot projects or case studies where certain usability techniques are incorporated informally, with the sole purpose of identifying some benefits that can be transmitted to the organization. Here the following topics are collected: 8- Usability informally; 9- Pilot project.

5) *Build and support a talented usability team:* This topic is related to the creation and support of a usability team that has expert personnel to integrate it, both at the project level and at the organizational level. This is important because it is up to this team to establish the procedures and goals for usability. In addition, said team requires a relevant role, with the required administrative capacities, to achieve success in terms of usability integration at the organizational level. The articles that address this issue present the following topics: 10- Build a usability team; 11- Relevant role to usability; 12- Usability manager.

### D. Taxonomy and model of interrelation between topics

Fig. 1 presents the taxonomy of higher order themes, the themes defined in the previous section and the codes used in the classification of the extracted texts. On the other hand, Fig. 2 presents the model resulting from analyzing the themes and establishing the relationships between them. It should be noted that there are relationships between topics that belong to different higher-order topics. In the model presented in Fig. 2, usability is introduced into the organization through a pilot project or informally in various development projects. In either case, the benefits of usability for the organization must be shown. In the same way, these two methods of introducing usability become vehicles for evangelization, allowing to consolidate or obtain the explicit support of management. One of the relevant topics in our research is the key people, allies in different departments, who show the benefits of usability. Therefore, key people are in charge of evangelizing usability in each of their departments. Obtaining the support of management is essential for it to provide the necessary resources to promote usability, just as it must promote the definition of a usability process at the corporate level and the creation of a set of usability goals. Regarding the resources for usability, it is necessary to define a usability team and

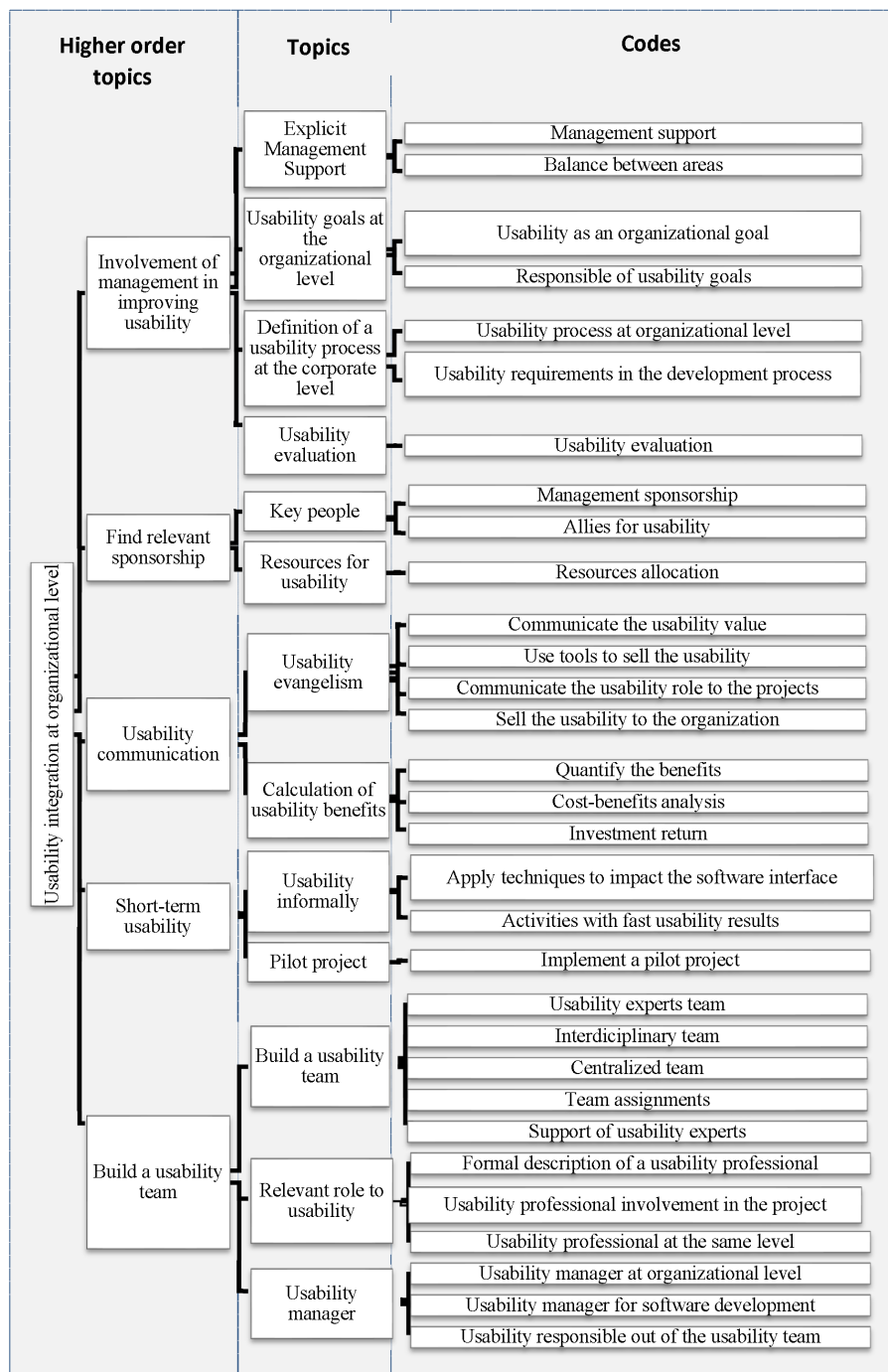


Fig. 1. Usability taxonomy of interrelated topics

a usability manager in such a way that they verify that the usability goals are met at the organizational level.

Regarding the usability process at the corporate level, the usability team is required to have a relevant role in the organization, in such a way that it can contribute to meeting the established usability goals. The fulfillment of the usability goals must be evaluated to maintain the explicit support of the management. Evaluation of the reliability of the synthesis carried out. The last step of the thematic synthesis is the reliability assessment. This should establish whether the research question has been answered. In our case, the research question

is "What are the practices, recommendations and lessons learned used in software development organizations to integrate usability from an organizational point of view?". In our opinion, the thirteen themes identified answer this question and the model obtained makes it possible to identify the themes and the interactions between them. It is also important to mention that, as shown in Table I, all the topics are supported by at least one empirical evaluation article, many of them generated in the industry, where recommendations, practices or lessons learned are presented. of usability goals must be evaluated to maintain explicit support from management.

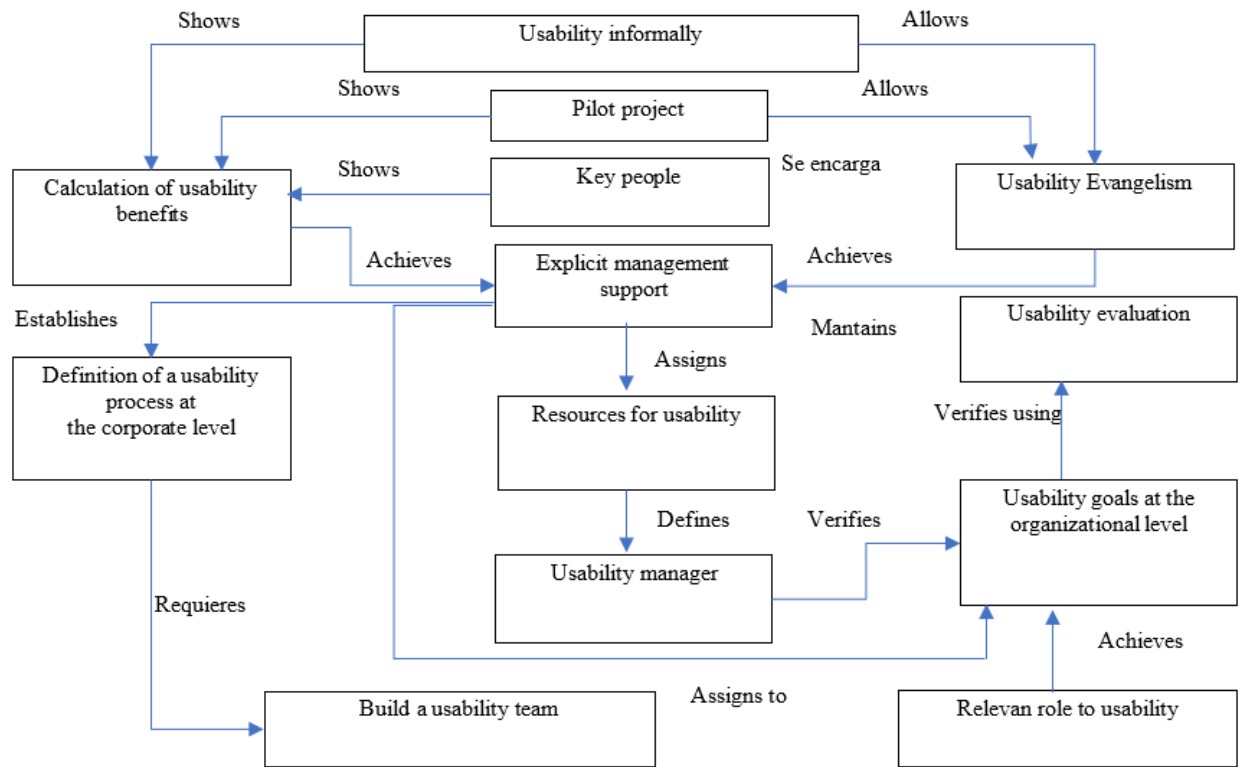


Fig. 2. Relational model between themes

### E. Evaluation of the reliability of the synthesis

The last step of the thematic synthesis is the reliability assessment. This should establish whether the research question has been answered. In our case, the research question is "What are the practices, recommendations and lessons learned used in software development organizations to integrate usability from an organizational point of view?". The thirteen identified topics answer this question and the model obtained makes it possible to identify the topics and the interactions between them. It is also important to mention that, as shown in Table I, all the topics are supported by at least one empirical evaluation article, many of them generated in the industry, where recommendations, practices or lessons learned are presented. Furthermore, with the exception of the topic of "usability goals at the organizational level", all topics are also supported by articles on the authors' experiences in integrating usability into practice.

On the other hand, the primary articles on which the thematic synthesis has been based have been obtained through a systematic mapping of the literature. In this sense, the threats to validity have been treated as follows: in terms of search coverage, the use of four databases (ACM, IEEE, ScienceDirect and Springer Link) can be mentioned. According to Peterson et al. [49], the use of ACM and IEEE, in addition to two indexed databases, would be sufficient to find relevant information on an area. Regarding the selection of studies to mitigate discrepancies regarding the criteria for including or excluding articles, the inclusion and exclusion criteria were carefully discussed by the authors. Furthermore, although the article

selection process was carried out mainly by the first author, the second author randomly selected 20% of the excluded articles to corroborate the results of the process.

Finally, in order to reduce the subjective bias of the first author in the final selection of the articles, these were also reviewed by the second author independently. The results of the evaluation were compared and disagreements resolved by consensus.

## IV. DISCUSSION AND CONCLUSIONS ON THE THEMATIC SYNTHESIS

In this research, different recommendations were recovered to achieve the incorporation of usability at the organizational level, mainly derived from case studies. As a summary of this work, 13 topics grouped into 5 higher order topics have been obtained. These topics group the important and necessary aspects to not only achieve usable software projects as a result, but also so that usability is present as part of the essence of the organization.

One of the main contributions of this work is the model of interrelation between the themes identified in this work. This model presents the existing knowledge in the literature on good practices to integrate usability at the corporate level. In addition, it is based on the 13 topics identified in this work. Fig. 3 shows the number of articles that support each topic, classified according to Wieringa [50] (i.e., evaluation, experience, opinion).

It can be seen that each theme is supported by at least one article with empirical evidence, either through case studies



or surveys. The most reliable topic is "usability evangelism" with nine articles with evidence of its application in practice; followed by "build a usability team" and "explicit management support" with six articles each. In our opinion, this phenomenon occurs because usability at the organizational level needs allies since the benefits can initially be seen as intangible. However, the evangelism has the mission of communicating the importance of usability in order to find allies who may have the resources, be it financial or personnel, to achieve its integration at the organizational level, as well as to convince developers of what relevant to this quality attribute. And on the other hand, to achieve success in said integration, it is necessary to establish a team of experts in the area of usability and have the support of management.

The topics with the least number of references with empirical evidence are "usability evaluation" with two of the six articles, "key people" with two of the five articles and "pilot project" with one of the four articles referencing it. In our opinion, the lack of empirical evidence regarding the topic of "usability evaluation" is due to the fact that usability maturity models present deficiencies such as the lack of guidelines for their application and the absence of explicit recommendations to improve usability maturity [51]. It is important to note that for the topics "key people" and "pilot project" the other three references that support it are articles on the authors' experiences when integrating usability into practice, which would also indirectly be supported by evidence.

The proposed model presents the pilot project methodology and the informal integration of usability as possible starting points to establish the benefits of its integration and thus convince management to achieve or strengthen their support in the process. The evaluation of the fulfillment of the organizational goals is important to maintain the explicit support of the management. For this, a relevant role of those responsible for usability is required to the extent that they can make the necessary decisions to guarantee the success of the integration of usability at the organizational level.

Finally, the proposed model can be useful for usability professionals and quality managers of software development organizations, since it constitutes a starting point to address

usability in a stable and sustainable way in the different projects of an organization. beyond the specific work that a project manager or the developers of a specific project can carry out.

## REFERENCES

- [1] E. Barnett-Page, J. Thomas, "Methods for the synthesis of qualitative research: a critical review. BMC medical research methodology," 9(1), 59.. 2009.
- [2] D. Cruzes, T. Dyba, "Recommended steps for thematic synthesis in software engineering," in Empirical Software Engineering and Measurement (ESEM), 2011 International Symposium on (pp. 275-284). IEEE, 2011.
- [3] C. Pope, N. Mays, J. Popay, "Synthesising qualitative and quantitative health evidence: A guide to methods: A guide to methods," McGraw-Hill Education (UK), 2007.
- [4] J. Fereday, E. Muir-Cochrane, "Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development," in International journal of qualitative methods, 5(1), 80-92, 2006.
- [5] M. Rajanen, "Introducing Usability Activities into Open Source Software Development Projects-Searching for a Suitable Approach," JITTA: Journal of Information Technology Theory and Application, 12(4), 5, 2011.
- [6] L. Chapman, S. Plewes, "A UX maturity model: Effective introduction of UX into organizations," in International Conference of Design, User Experience, and Usability, pp. 12-22. Springer, Cham, 2014.
- [7] A. Cajander et al., "Towards a usability coaching method for institutionalizing usability in organisations," Human-Computer Interaction, pp. 86-97, 2010.
- [8] S. Bloomer, R. Croft, "Pitching usability to your organization", Interactions, 4(6), 18-26, 1997.
- [9] G. Venturi et al., "People, organizations, and processes: An inquiry into the adoption of user-centered design in industry," International Journal of Human-Computer Interaction, 21(2), pp. 219-238, 2006.
- [10] E. Eriksson, A. Swartling, "UCD Guerrilla Tactics: A Strategy for Implementation of UCD in the Swedish Defence," in Human Work Interaction Design-HWID2012, pp. 116-126, 2012.
- [11] J. Rohn, "How to organizationally embed UX in your company," interactions, 14(3), pp. 25-28, 2007.
- [12] J. Gulliksen et al., "Key principles for user-centred systems design", Behaviour and Information Technology, 22(6), pp. 397-409, 2003.
- [13] R. Lanzilotti et al., "Addressing Usability and UX in Call for Tender for IT Products", in INTERACT 2015 Adjunct Proceedings: 15th IFIP TC. 13 International Conference on Human-Computer Interaction 14-18 September 2015, Bamberg, Germany. University of Bamberg Press, 2015.
- [14] C. Ardito et al., "Investigating and promoting UX practice in industry: An experimental study" International Journal of Human-Computer Studies, 72(6), 542-551, 2014.
- [15] T. Komischke, "Integrating User Experience into a Software Development Company-A Case Study", Human Centered Design, pp. 221-229, 2019.
- [16] A. Sharma, "Institutionalization of usability in banking software environment: tasks and challenges" in International conference on research into design (ICoRD11), ISBN, pp. 978-981, 2011.
- [17] S. Rosenbaum et al., "A toolkit for strategic usability: results from workshops, panels, and surveys", in Proceedings of the SIGCHI conference on Human Factors in Computing Systems, pp. 337-344. ACM, 2000.
- [18] D. Mayhew, "Strategic Development of the Usability Engineering Function," interactions 6, 5, 2009.
- [19] J. Gulliksen et al., "User-Centred System Design as Organisational Change: A Longitudinal Action Research Project to Improve Usability and the Computerized work Environment in Public Authority", International Journal of Technology and Human Interaction, 2009.
- [20] M. Rajanen, N. Iivari, "Usability cost-benefit analysis: How usability became a curse word?", in IFIP Conference on Human-Computer Interaction, pp. 511-524. Springer, Berlin, Heidelberg, 2007.
- [21] H. Duh et al. "The Management Model Development of User Experience Design in Organization," in International Conference on Cross-Cultural Design, pp. 163-172. Springer International Publishing, 2016.
- [22] McCreary, et al. "Infusing user experience into the organizational DNA of an enterprise IT shop," in International Conference on HCI in Business, pp. 513-524. Springer International Publishing, 2015.

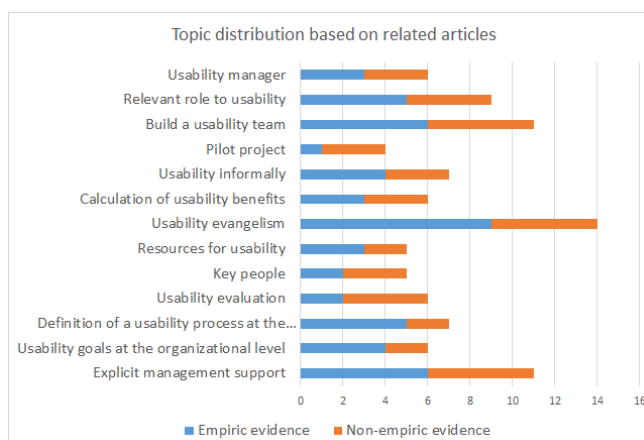


Fig. 3. Evidence distribution



- [23] V. Bruno, M. Dick, "Making usability work in industry: an Australian practitioner perspective," in Proceedings of the 19th Australasian conference on Computer-Human Interaction: Entertaining user interfaces, pp. 261-264. ACM, 2007.
- [24] X. Ferré et al. "Usability basics for software developers," IEEE software, 18(1), 22-29, 2021.
- [25] K. Vredenburg et al. "A survey of user-centered design practice," in Proceedings of the SIGCHI conference on Human factors in computing systems, pp. 471-478. ACM, 2002.
- [26] D. Lee, Y. Pan, "Lessons from applying usability engineering to fast-paced product development organizations," Usability and internationalization. HCI and culture, pp. 346-354, 2007.
- [27] E. Eriksson, "Introducing usability roles in public authorities," in Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges, pp. 113-122. ACM, 2008.
- [28] G. Donahue, "Usability and the bottom line," IEEE software, 18(1), 31-37, 2001.
- [29] N. Livari, P. Abrahamsson, "The interaction between organizational subcultures and user-centered design—a case study of an implementation effort," in System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on, pp. 3260-3268. IEEE, 2002.
- [30] J. Zhu, "Make user-centered design sustainable in China. Design, User Experience, and Usability," Theory, Methods, Tools and Practice, pp. 509-518, 2011.
- [31] C. Wong et al. "Advocating UX practice in industry: Lessons learnt from UX innovate bootcamp," in User Science and Engineering (i-USER), 2016 4th International Conference on, pp. 204-209. IEEE, 2016.
- [32] D. Sward, "User Experience Design: A Strategy for Competitive Advantage," AMCIS 2007 Proceedings, 163, 2007.
- [33] R. Hoegh, "Case study: integrating usability activities in a software development process," Behaviour Information Technology, 27(4), pp. 301-306, 2008.
- [34] G. Stompff et al. "User Centered Design in the wild," in DS 68-1: Proceedings of the 18th International Conference on Engineering Design (ICED 11), Impacting Society through Engineering Design, Vol. 1: Design Processes, Lyngby/Copenhagen, Denmark, 2011.
- [35] K. Aikio, "Exporting Usability Knowledge into a Small-Sized Software Development Organization—A Pattern Approach," in Symposium on Human Interface and the Management of Information, pp. 3-11. Springer, Berlin, Heidelberg, 2007.
- [36] C. Lutsch, "ISO Usability Standards and Enterprise Software: A Management Perspective. Design, User Experience, and Usability," Theory, Methods, Tools and Practice, pp. 154-161, 2011.
- [37] E. Onal et al. "Enabling Better User Experiences across Domains: Challenges and Opportunities Facing a Human Factors Professional" in International Conference of Design, User Experience, and Usability, pp. 81-89. Springer International Publishing, 2014.
- [38] H. Hao, A. Jaafar, "Usability in practice: Perception and practicality of management and practitioners," in Pattern Analysis and Intelligent Robotics (ICPAIR). IEEE, 2011.
- [39] B. Kern et al. "Corporate UX Guidelines: Policies and Publication," 2016;
- [40] T. Jokela. "Evaluating the user-centredness of development organisations: conclusions and implications from empirical usability capability maturity assessments". Interacting with Computers, 16(6), 1095-1132, 2004.
- [41] K. Viikki, J. Palviainen. "Integrating human-centered design into software development: An action research study in the automation industry". In Software Engineering and Advanced Applications (SEAA), 2011 37th EUROMICRO Conference on, pp. 313-320. IEEE.
- [42] V. Bruno, M. Dick. "Improving usability outcomes for each of the usability practitioner roles". In Electronic Journal of Information Systems Evaluation, 16(3), pp. 173-187, 2013.
- [43] M. Hindi, A. Khalil. "Usability practice and awareness in UAE". In Current Trends in Information Technology (CTIT), 2011 International Conference and Workshop on, pp. 1-6. IEEE, 2011.
- [44] O. Almughram, S. Alyahya. "Coordination support for integrating user centered design in distributed agile projects". In Software Engineering Research, Management and Applications (SERA), 2017 IEEE 15th International Conference on, pp. 229-238. IEEE, 2017.
- [45] C. Paul. "A survey of usability practices in Free/Libre/Open source software". In Open Source Ecosystems: Diverse Communities Interacting, pp. 264-273, 2009.
- [46] A. Cajander et al. "On the establishment of user-centred perspectives". In Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational, pp. 103-112. ACM, 2014.
- [47] K. Pariya, R. Feldt, A. Nilsson. "Integrating UX principles and practices into software development organizations: A case study of influencing events". In Journal of Systems and Software, Volume 154, 2019.
- [48] J. Gulliksen et al. "Usability professionals—current practices and future development". Interacting with computers, 18(4), 568-600, 2006.
- [49] K. Petersen, S. Vakkalanka, L. Kuzniarz. "Guidelines for conducting systematic mapping studies in software engineering: An update," in Information and Software Technology, 64, 1-18, 2015.
- [50] Wieringa, R., Maiden, N., Mead, N. et al. Requirements engineering paper classification and evaluation criteria: a proposal and a discussion. Requirements Eng 11, 102–107 (2006).
- [51] C. Carvajal, A. M. Moreno, "The maturity of usability maturity models". In Communications in Computer and Information Science, vol. 770, pp. 85–99, 2017.