Towards a Measurement Scale of Organizational Readiness for Personas

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ABSTRACT

User studies have found persona application challenging. We argue that a potential reason for the challenges is the organization's readiness to apply personas. This research reports the on-going effort of developing the Persona Readiness Scale, a survey instrument for organizations' readiness for personas. The scale involves twenty-two items from seven dimensions: Need Readiness, Culture Readiness, Knowledge Readiness, Resource Readiness, Data and Systems Readiness, Capability Readiness, and Goal Readiness. Organizations can apply the current scale to evaluate their persona readiness but using the dimensions for statistical analyses requires further empirical validation.

CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI).

KEYWORDS

Persona adoption, Survey instrument, Personas, Psychometrics

ACM Reference Format:
Joni Salminen, Lene Nielsen, Soon-Gyo Jung, and Bernard J. Jansen. 2021. Towards a Measurement Scale of Organizational Readiness for Personas. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '21 Extended Abstracts), May 08–13, 2021, Yokohama, Japan.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3411763.3451763

1 INTRODUCTION

Personas are fictitious user types [11] that represent needs, wants, and circumstances of different user groups [33] that are considered important to be included in a design process by software developers, designers, marketers, or other stakeholders involved in user-centric decision making [37]. Prior research has shown that personas are widely applied in both research and industrial practices [1]. A recent review of the Human-Computer Interaction (HCI) literature has shown that personas are studied and deployed continuously [15].

Despite the importance and use of Persona in HCI, research has shown that there exists multiple organizational challenges, particularly with regards to adoption and active use of personas [14, 17, 30, 41, 43]. In the current work, we argue that many of these challenges can be attributed to organizations' lack of readiness in adopting personas in their everyday workflow. Readiness is used in this research as an overarching term to describe how prepared organizations are for persona adoption. It therefore, addresses the question: "Are we, as an organization, fully equipped to adopt personas?". According to our experience, despite its importance, this question is rarely asked. This apect differs from the many maturity models in HCI (e.g. [47]) as it offers an insight into the readiness for starting with personas, rather than maturity of persona usage.

The non-adoption and inactive use of personas may relate to the lack of readiness in a broader organizational scheme of culture, capabilities, and clear articulation of goals and metrics for persona projects. To remedy this matter, the current work describes the development of a persona readiness scale (PRS) that can help organizations evaluate how equipped they are in adopting personas. This scale can be used by organizations to evaluate how equipped they are to use and adopt personas in their everyday workflow.

While the question of readiness applies to all kinds of personas, including those created using qualitative [6] and quantitative [42] methods, if an organization decides to pursue algorithmically generated data-driven personas [2, 3], this sets additional requirements for data science related competencies and resources. Yet, based on our encounters with practitioners, many organizations assume that since they have a social media account, they can automatically generate data-driven personas, which is an incorrect assumption. The organizations need more than that. From a holistic point of view, they need top management support, financial resources, a concrete plan to make use of personas, and so on. It is the measurement of these factors that the PRS addresses.

2 RELATED WORK

Criticism of personas is common and involves, e.g., the lack of methodological robustness, small sample sizes, lack of accuracy and precision, difficulty of evaluation, and unproven use cases and

CHI '21 Extended Abstracts, May 08–13, 2021, Yokohama, Japan

ACM ISBN 978-1-4503-8095-9/21/05…$15.00
https://doi.org/10.1145/3411763.3451763

benefits [9, 14, 19, 30, 41, 44]. More importantly, demonstrating real value from personas has proven to be difficult.

While there certainly can be methodological challenges in how personas are created [19], as well as challenges in terms of personas being vulnerable to overgeneralization and stereotypes [27, 28], it is also true that personas are often not properly implemented [40, 41]. For instance, Rönkkö et al. [41] report a case where applying personas to a software development project failed, specifically arguing that "*The problem was not with the user; socio-political factors in the branch in which the software was developed proved to be of much greater importance.*" (p. 112). This implies that organizational factors, such as participation, empowerment, and development of routines influence the success of persona projects [41]. This is also consistent with findings from empirical persona studies [14, 30, 36], which support the notion that organizational factors are highly influential for the eventual success or failure of persona projects. It may be that organizations, in some cases, are not ready for the adoption of personas.

Nielsen and Storgaard-Hansen [35] mention lack of organizational maturity as a root cause for persona failure. Seidelin et al. [48] present preliminary evidence of the association between persona success and UX maturity. Furhermore, one of the participants in a user study by Billestrup et al. [5] argues that the lack of maturity was blocking the organization's adoption of personas: "*I would like to introduce personas in my current employment but the company needs to be at a higher level of maturity before it would make sense.*" (p. 256). This quotation contains insightful thinking in that personas require certain prerequisites from the organization. This is often ignored with the logic of "*Let's create personas and then think what we can do with them.*"

The differences in persona readiness can possibly explain the divergent views in the literature, wherein some authors argue that personas are *not* applicable [41] while others argue they *are* applicable [35]. If organizational readiness for personas indeed varies and affects the successfulness of a project, the logical question is, how can we measure this readiness? In this effort, readiness and maturity models regarding UX and related applications [10, 13, 26, 47] can offer inspiration for the development of a persona-specific readiness scale.

From this starting point, we begin our process for the development of the PRS, an instrument for measuring organizational readiness for persona adoption. The scale considers qualitative, quantitative, and mixed-method personas, with slight adaptation of questions for each.

3 METHODOLOGY

3.1 Strategy for Scale Development

We begin by investigating technology readiness and maturity scales from HCI, Information System Sciences, and general Computer Science literature so as to identify constructs and items (i.e., statements, questions) that researchers have developed to measure the readiness/maturity of an organization to adopt user-centered technologies, such as big data, analytics, UX tools, or applied machine learning. The premise is that the readiness for such technologies reflects the readiness for other customer-centric design methods, such as personas. As personas contain specific considerations (as discussed in Section 2.2), these scales may not be directly applicable to the context of personas, and a new scale developed specifically for personas is needed.

3.2 Literature Searches

Following this premise, the search strategy was based on first defining seed terms that are likely to result in finding relevant scales to inspire the development of our scale. These seed terms were as follows:

+ technology, analytics, "big data", "artificial intelligence", "data science"
+ readiness, maturity
+ scale, instruments

The concept of readiness is similar to that of maturity [5], which is why we used both terms. The seed terms were combined into separate search phrases (e.g., +technology +readiness +scale), resulting in 20 of such combinations. Searches with these phrases were then conducted in Google Scholar and Science Direct. In total, Google Scholar yielded 2,734,310 results for all the searches combined, while Science Direct yielded 158,582 results. We reviewed only the top results for each search phrase because of the vast number of articles located. The breakdown of the number of results per search and the number of screened results can be found in the Supplementary Material[1]. In total, we screened 2,979 articles.

3.3 Screening Procedure

The screening was done by reviewing the abstract texts. Here, we looked for indications that the article develops a technological readiness or maturity scale. Based on the screening, 52 articles were identified as candidates. The corresponding full-text articles were then downloaded and reviewed for inclusion or exclusion. The exclusion criteria were:

[1] is not a peer-reviewed full article (e.g., a thesis or workshop paper) (n=5 articles matching the criterion)
[2] does not develop a scale for technology readiness or maturity (n=1)
[3] does not focus on organizations (but, e.g., on users or consumers) (n=1)
[4] does not contain actual measurement items (but a conceptual analysis or framework only) (n=32)
[5] does not contain a full list of items (but only examples) (n=3)

In addition, two articles were not available to download, and one article contained a duplicate scale already included from the same authors. In total, 45 articles were excluded (87%), with seven articles (13%) remaining. The Supplementary Material shows the included and excluded articles, along with the reasons for exclusion.

3.4 Development of Constructs and Items

We then recorded each construct (i.e., the phenomenon that the study measures) and item (i.e., a statement or question for organizational decision makers) from the qualified seven articles in a spreadsheet. The identified constructs (n=42) and items (n=155) were used as inspiration to create the Persona Readiness Scale.

[1] https://www.dropbox.com/s/me5il5v72pxd96e/supplementary%20material_chi%20lbr.xlsx?dl=0

Table 1: The dimensions of PRS. Dimensions (e) and (f) vary based on if the purpose is to measure qualitative or quantitative persona readiness, as these have specific requirements regarding data structures and skills needed [42].

Readiness dimension	Description
(a) Need readiness (NR)	Operational, tactical and strategic need for personas. Also an indicator to measure perceived usefulness, and importance of personas
(b) Culture readiness (CR)	Commitment to understand users, user-centricity in decision making, empathetic thinking
(c) Knowledge readiness (KR)	Basic understanding of the concept of personas and knowledge of their applications in real use cases
(d) Resource readiness (RR)	Resource availability: finances, people, training
(e) Data and systems readiness (DR)	*Quantitative:* active collection, volume, variability, veracity, velocity of user data. *Traditional*: focus groups, interview transcripts, analysis of pain points, needs, and wants
(f) Capability readiness (BR)	*Quantitative:* technical competence on algorithms, databases, and data science, expertise on user segmentation. *Qualitative* survey methods, qualitative research, such as ethnography or interviews
(g) Goal readiness (GR)	Measurement of performance, metrics defined, implementation plan with real use cases

This process included (a) removing redundant items that refer to the same idea and (b) modifying/rewriting the items so that their content is relevant for the concept of persona readiness. The inspirational constructs and items, along with their assessment of relevance for personas, can be seen in the Supplementary Material.

4 THE PERSONA READINESS SCALE

Table 1 shows the seven dimensions of the PRS. Each dimension is discussed in the following subsections.

4.1 Need Readiness (NR)

NR implies that the organization has an awareness of the benefits of personas, which is not always the case [17, 30, 36], as negative connotations may be associated with personas [44] and management support may be lacking [35]. These benefits are also accepted as feasible or lucrative for the organization; i.e., the feasibility of implementation [22]. In other words, there is a recognized "need" for personas. This perceived need for technology can vary depending on the organizational level [25]: senior management may perceive personas important for strategic decisions; middle management for tactical decisions; and operational staff (e.g., software developers, designers, and user support) for operational (daily) decisions. This dimension and its items are inspired by the Strategic Readiness (SR) [25], Managerial Acquiescence (MA) [39], and Urgency to Change (UC) [22] constructs in related literature.

4.2 Culture Readiness (CR)

CR expresses the commitment to understanding users (user-centric orientation [23]) in general and valuing empathy as part of the user-centric decision-making process. The importance of empathy arises from the persona literature [11, 16, 29, 35], where the consensus is that empathy is, on the one hand, enhanced by personas and, on the other hand, results in more user-centric (and therefore better) design and product development choices. This dimension and its items are inspired by the Organizational Culture Readiness (OC) [22], Cultural Readiness (CL) [25], Culture (CU) [4], Customer Orientation (CO) [23], Market Orientation (MO) [54], and Developmental Culture (DC) [23] constructs in related literature.

4.3 Knowledge Readiness (KR)

KR involves basic understanding of the concept of personas among the team members and experience in applying personas for real use cases. The lack of experience can be detrimental for persona application [45, 46], simply because questions, doubts, and lack of reference examples hinder a decision maker's ability to make use of personas in a meaningful way. Lack of clarity on what personas are is a prime proponent to making them appear abstract, impersonal, and untrustworthy to decision makers [30]. This dimension is inspired by the Cognitive readiness (CG) [25] and Employee Engagement (EE) [39] constructs in related literature.

4.4 Resource Readiness (RR)

RR relates to the availability of crucial resources for the persona project, including persona creation, evaluation, and implementation. This may be conducted by in-house personnel or an external consultancy. Lifecycle thinking of personas [1] is important, as organizations might not properly follow-through with persona application after their creation [40, 41]. Moreover, the organization needs an appointed point of contact with the responsibility to ensure the success of the persona project, including their creation, application, and updating for the organization's needs. This person is sometimes characterized as "persona champion" [31, 51]. Finally, training is provided for the team members not familiar with personas. This dimension and its items are inspired by the Resource Readiness (RR) [25], Employee Involvement (EI) [22], Partnership Readiness (PR) [25], Facilitating Conditions [50], and Training (TA) [4] constructs in related literature.

4.5 Data and Systems Readiness (DR)

DR refers to activities supporting the creation of high-quality personas [8, 9]. This is characterized by the continuous collection of user data that corresponds with the big user data characteristics of volume, variability, veracity, and velocity [49]. The data has to satisfy the requirements of creating truthful and diverse persona sets that contain complete information to be helpful for team members' decision-making tasks (the "rounded persona" principle [34]). The exact data requirements depend on the applied persona creation approach [19]. For quantitative personas, this dimension and its items are inspired by the IT readiness (IT) [25], Technology compatibility

Table 2: Items of the PRS. Items marked with [D] are optional for qualitative personas, whereas items marked with [T] are optional for quantitative personas. Items with either are required. Mixed-method personas [37] may utilize all statements.

Need	Culture	Knowledge	Resource	Data and system	Capability	Goal
•NR01: Our organization needs personas.						
•NR02: We consider personas important.						
•NR03: Personas would be useful for us.						
•NR04: We need personas now.						
	•CR01: User understanding is crucial for us.					
	•CR02: Empathy is required for understanding users.					
		•KR01: Most of the people in our organization know what a persona is.				
		•KR02: Most of the people in our organization have used personas in their work.				
		•KR03: We know how to use personas.				
			•RR01: We have a person in our organization who is strongly advocating for personas.			
			•RR02: We have a dedicated budget for persona creation and implementation.			
			•RR03: Training is available for team members not familiar with personas.			
				•DR01: We actively collect user data. [D]		
				•DR02: We have extensive user data, including behavioral and demographic information.		
				•DR03: Our user data is frequently updated. [D]		
				•DR04: Our user data is rich, including user interviews or written feedback. [T]		
					•BR01: We have data science expertise. [D]	
					•BR02: We have advanced know-how on user segmentation.	
						•GR01: We have a plan for implementing personas after their creation.
						•GR02: We have quantitative goals for persona use.
						•GR03: We have clearly defined use cases for personas.
						•GR04: We have defined quantitative metrics to measure the results of persona use.

Notes: We == our organization. 'User' can be replaced by 'customer'.

(TC) [54], and Technological Orientation (TO) [23] constructs in related literature.

4.6 Capability Readiness (BR)

BR involves technical competence to operate systems and data required for data-driven persona generation [20]. This includes knowledge on algorithms, user data structures, databases, external data sources such as APIs [20, 21], as well as sound understanding of user segmentation principles and how these relate to statistical techniques such as dimensionality reduction [18] that is often used for persona generation [2, 3]. As with data, the exact required capabilities depend on the persona creation approach (qualitative, quantitative, or mixed [32]) applied. For quantitative personas, this dimension is inspired by Big Data Capability (BC) [23], Data Analysis Expertise (DA) [4], Analytical Skills (AS) [38], and IT & Data Skills (DS) [38] constructs.

4.7 Goal Readiness (GR)

GR refers to the tracking of performance outcomes. If personas are left unattended after their creation, the effort put into the project can easily become wasted [7, 9]. Personas also need to support the achievement of the team's goals to make the team receptive to personas [40, 48]. For these reasons, performance metrics (e.g., marketing outcomes, user satisfaction) are required to gauge the success of the persona project. The metrics should be aligned with an implementation plan (i.e., a list of campaigns/projects/activities/programs where personas are to be applied, along with a description of who and by whom), and tangible numerical goals (e.g., deploying personas will improve the surveyed user satisfaction by 15% within six months of the introduction of the finalized personas). This dimension is inspired by the Measurement System Readiness (MS) [22], Policy Orientation (PO) [54], and Communication and Policy Application (CP) [4] constructs.

4.8 Measurement Items

Table 2 shows the twenty-two items of the PRS. The scale interpretation is discussed thereafter.

4.9 Interpreting the Scores

As stated, the PRS includes 22 statements. The implementation of PRS can be done using a standard Likert Scale, with options ranging from Strongly Disagree (1) to Strongly Agree (5). Given this, the maximum number of "points" an organization can achieve using the scale is $22 \times 5 = 110$. The minimum score, in turn, is $22 \times 1 = 22$. This leaves a range of $110 - 22 = 88$ points in between. Dividing these points evenly across three classes, the interpretation would be as follows:

- 22–51 points indicates **Low Persona Readiness**
- 52–81 points indicates Mediocre Persona Readiness
- 82–110 points indicates **High Persona Readiness**

Regarding future research, it would be highly interesting to investigate how many organizations fall into each category, and if

indeed, as it is claimed in the literature [1, 24], personas are broadly accepted in the industry.

In the following, we provide indicators that characterize the extreme cases of low and high persona readiness. **Organizations with low persona readiness:**

- Do not perceive a need for personas. Do not consider personas important. Do not think personas would be useful.
- Do not think user understanding is crucial. Do not think empathy is needed for understanding users, defining requirements, and making product decisions.
- Do not understand the concept of personas. Do not have a clear picture of applying personas in real use cases.
- Do not have a "champion" for personas. Do not have a budget for persona creation and implementation. Do not provide training for team members about personas.
- Do not actively collect user data. Do not have much user data. The user data is dated. The user data is shallow.
- Do not have data science expertise. Do not have advanced user segmentation know-how.
- Do not have a plan for implementing personas after their creation. Do not have goals for persona use. Do not have clear use cases. Do not have defined quantitative metrics for goal attainment.

In turn, **organizations with high persona readiness:**

- Perceive a need for personas. Consider personas important. Think personas would be useful for them.
- Believe user understanding is crucial. Believe empathy is needed for understanding users, defining requirements, and making product decisions.
- Understand the concept of personas. Have a clear picture of applying personas in real use cases.
- Have a "champion" for personas. Have a budget for persona creation and implementation. Provide training for team members not familiar with personas.
- Actively collect user data. Have much user data, including behavioral and demographic information on the users. The user data is updated. The user data is rich, including user interviews or written feedback.
- Have data science expertise. Have advanced user segmentation know-how.
- Have a plan for implementing personas after their creation. Have quantitative goals for persona use. Have defined clear use cases. Have defined quantitative metrics for goal attainment.

5 DISCUSSION AND IMPLICATIONS

5.1 Theoretical IMPLICATIONS

Systematic analysis of persona adoption and active use is missing from the HCI literature, with major focus being on persona creation and application on isolated projects that, in many cases, report conflicting findings. Some prior studies report positive effects from persona use [6, 35, 44], while others report negative [30, 40, 41] or neutral [14] effects. Here, we proposed that organizational readiness could explain the conflicting findings. Thus, attention should be paid to organization-wide adoption of personas. According to this logic, the chances of success can be improved by assessing the persona readiness of the organization. We propose that this assessment should be carried out *before* moving to persona creation; so the steps of a persona project are:

Persona readiness assessment → (Persona readiness improvement) → Persona creation → Persona deployment → Persona monitoring

The constructs of PRS are based on several previous scales [4, 22, 25, 39, 54]. Our main contribution is adapting those constructs to the context of personas, which has not been done before.

5.2 Practical Implications

Knowing the current state of persona readiness of a given organization can help locate points of improvement. Addressing these points before even starting the persona creation can increase the likelihood of success for the persona project. As persona creation is costly, time-consuming, and resource-intensive [52, 53], any activities that improve the prospect of success should be undertaken when pursuing persona projects.

An example: an organization ranks relatively high on other dimensions except for goal readiness. A further examination reveals that a plan for deployment and metrics (GR01, GR04) are especially low. The organization now directly knows to address these shortcomings to increase their persona readiness.

In particular, stakeholders such as **(a) design consultancies/service provides** offering persona services to organizations and **(b) organizations themselves** can use the PRS, along with the suggested scoring system, to gauge their persona readiness before launching costly projects. The scale can help identify specific areas of improvement (e.g., regarding current persona knowledge in the organization, adequacy of financial resources, and if there is a plan for the implementation, along with concrete goals and success metrics).

It is crucial to deploy the scale at multiple levels of the organization to avoid siloed thinking, a problem related to personas. Especially when personas are owned by marketing and used by design, then communication does not necessarily flow both ways [12]. To avoid such cases, the PRS should be deployed across departments. The PRS should also be deployed across different organizational positions involved with user-related decisions, and the top management (or the management level responsible for resource allocation) should complete the PRS as well. The number of people taking the PRS depends on the size of the organization. For a startup with a handful of people, there cannot be many respondents. For a large multinational, however, tens of people can take the survey depending on their involvement with user/customer decision making.

When multiple people in the organization complete the PRS, the scores will be assigned based on the average ratings given by all the respondents (see Section 4.9 for interpreting the scores).

Finally, increasing an organization's persona readiness is not self-evident. It may take considerable effort to improve the persona readiness and overcome elements of friction and resistance [48], such as perceiving personas as irrelevant tools [30], lacking management support, and creating a supportive culture [48].

5.3 Future Work

The next research step includes conducting a pilot study to (a) clarify that the statements in the PRS make sense to participants (clarity, content), and (b) test that the items load appropriately to the proposed dimensions (factor analysis). Once the reliability and validity of the scale have been established, it can be used to investigate persona readiness at multiple levels: how ready organizations are, *in general*, for personas; how readiness differs by *industry or domain of application*; and how ready *a specific organization* is to take on a persona project. However, the simple scoring scheme proposed in Section 4.9 can be used for scale deployment in its current form (assuming an equal importance of each dimension).

6 CONCLUSION

In this work, we proposed a persona readiness scale. The scale has seven dimensions and twenty-two items, and it accommodates qualitative, quantitative, and mixed-method personas. Organizations can administer the scale directly or with the help of UX design agencies. Future research is needed to empirically assess the validity and reliability of the scale.

REFERENCES

[1] Tamara Adlin and John Pruitt. 2010. *The Essential Persona Lifecycle: Your Guide to Building and Using Personas* (1st ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

[2] Jisun An, Haewoon Kwak, Soon-gyo Jung, Joni Salminen, and Bernard J. Jansen. 2018. Customer segmentation using online platforms: isolating behavioral and demographic segments for persona creation via aggregated user data. *Social Network Analysis and Mining* 8, 1 (2018). DOI: https://doi.org/10.1007/s13278-018-0531-0

[3] Jisun An, Haewoon Kwak, Joni Salminen, Soon-gyo Jung, and Bernard J. Jansen. 2018. Imaginary People Representing Real Numbers: Generating Personas from Online Social Media Data. *ACM Transactions on the Web (TWEB)* 12, 4 (2018), Article No. 27. DOI: https://doi.org/10.1145/3265986

[4] Kimberly E. Arnold, Steven Lonn, and Matthew D. Pistilli. 2014. An exercise in institutional reflection: The learning analytics readiness instrument (LARI). In *Proceedings of the fourth international conference on learning analytics and knowledge*, 163–167.

[5] Jane Billestrup, Jan Stage, Anders Bruun, Lene Nielsen, and Kira S. Nielsen. 2014. Creating and Using Personas in Software Development: Experiences from Practice. In *Human-Centered Software Engineering* (Lecture Notes in Computer Science), Springer, Berlin, Heidelberg, 251–258. DOI: https://doi.org/10.1007/978-3-662-44811-3_16

[6] Asa Blomquist and Mattias Arvola. 2002. Personas in action: ethnography in an interaction design team. In *Proceedings of the second Nordic conference on Human-computer interaction*, ACM, Aarhus, Denmark, 197–200. Retrieved May 28, 2017 from http://dl.acm.org/citation.cfm?id=572044

[7] Susanne Bødker, Ellen Christiansen, Tom Nyvang, and Pär-Ola Zander. 2012. Personas, people and participation: challenges from the trenches of local government. In *Proceedings of the 12th Participatory Design Conference: Research Papers - Volume 1*, ACM Press, Roskilde, Denmark, 91–100. DOI: https://doi.org/10.1145/2347635.2347649

[8] Christopher N. Chapman, Edwin Love, Russell P. Milham, Paul ElRif, and James L. Alford. 2008. Quantitative Evaluation of Personas as Information. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 1107–1111. DOI: https://doi.org/10.1177/154193120805201602

[9] Christopher N. Chapman and Russell P. Milham. 2006. The Personas' New Clothes: Methodological and Practical Arguments against a Popular Method. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 634–636. DOI: https://doi.org/10.1177/154193120605000503

[10] Lorraine Chapman and Scott Plewes. 2014. A UX maturity model: Effective introduction of UX into organizations. In *International Conference of Design, User Experience, and Usability*, Springer, 12–22.

[11] Alan Cooper. 1999. *The Inmates Are Running the Asylum: Why High Tech Products Drive Us Crazy and How to Restore the Sanity* (1 edition ed.). Sams - Pearson Education, Indianapolis, IN.

[12] Sabrina Duda. 2018. Personas—Who Owns Them. In *Omnichannel Branding: Digitalisierung als Basis erlebnis- und beziehungsorientierter Markenführung*, Vittoria von Gizycki and Carola Anna Elias (eds.). Springer Fachmedien Wiesbaden, Wiesbaden, 173–191. DOI: https://doi.org/10.1007/978-3-658-21450-0_8

[13] Jennifer Fraser and Scott Plewes. 2015. Applications of a UX maturity model to influencing HF best practices in technology centric companies–Lessons from Edison. *Procedia Manufacturing* 3, (2015), 626–631.

[14] Erin Friess. 2012. Personas and Decision Making in the Design Process: An Ethnographic Case Study. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '12), ACM, New York, NY, USA, 1209–1218. DOI: https://doi.org/10.1145/2207676.2208572

[15] Chu Hiang Goh, Narayanan Kulathuramaiyer, and Tariq Zaman. 2017. Riding Waves of Change: A Review of Personas Research Landscape Based on the Three Waves of HCI. In *Information and Communication Technologies for Development* (IFIP Advances in Information and Communication Technology), Springer International Publishing, Cham, 605–616. DOI: https://doi.org/10.1007/978-3-319-59111-7_49

[16] Jonathan Grudin. 2006. Why Personas Work: The Psychological Evidence. In *The Persona Lifecycle*, John Pruitt and Tamara Adlin (eds.). Elsevier, 642–663. DOI: https://doi.org/10.1016/B978-012566251-2/50013-7

[17] T. W. Howard. 2015. Are Personas Really Usable? *Communication Design Quarterly Review* 3, 2 (2015), 20–26. DOI: https://doi.org/10.1145/2752853.2752856

[18] Xuan Huang, Lei Wu, and Yinsong Ye. 2019. A Review on Dimensionality Reduction Techniques. *International Journal of Pattern Recognition and Artificial Intelligence* 33, 10 (September 2019), 1950017. DOI: https://doi.org/10.1142/S0218001419500174

[19] Bernard J. Jansen, Soon-gyo Jung, Joni Salminen, Kathleen Guan, and Lene Nielsen. 2021. Strengths and Weaknesses of Persona Creation Methods: Outlining Guidelines for Novice and Experienced Users and Opportunities for Digital Innovations. In *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Virtual conference.

[20] Soon-Gyo Jung, Joni Salminen, and Bernard J. Jansen. 2020. Giving Faces to Data: Creating Data-Driven Personas from Personified Big Data. In *Proceedings of the 25th International Conference on Intelligent User Interfaces Companion* (IUI '20), Association for Computing Machinery, Cagliari, Italy, 132–133. DOI: https://doi.org/10.1145/3379336.3381465

[21] Soon-gyo Jung, Joni Salminen, Haewoon Kwak, Jisun An, and Bernard J. Jansen. 2018. Automatic Persona Generation (APG): A Rationale and Demonstration. In *Proceedings of the 2018 Conference on Human Information Interaction & Retrieval*, ACM, New Brunswick, NJ, USA, 321–324. DOI: https://doi.org/10.1145/3176349.3176893

[22] Sarina Abdul Halim Lim and Jiju Antony. 2016. Statistical process control readiness in the food industry: Development of a self-assessment tool. *Trends in food science & technology* 58, (2016), 133–139.

[23] Canchu Lin and Anand Kunnathur. 2019. Strategic orientations, developmental culture, and big data capability. *Journal of Business Research* 105, (2019), 49–60.

[24] Claudia Loitsch, Gerhard Weber, and Jens Voegler. 2016. Teaching accessibility with Personas. In *International Conference on Computers Helping People with Special Needs*, Springer, 453–460.

[25] Sachithra Lokuge, Darshana Sedera, Varun Grover, and Xu Dongming. 2019. Organizational readiness for digital innovation: Development and empirical calibration of a construct. *Information & management* 56, 3 (2019), 445–461.

[26] Aaron Marcus, Richard Gunther, and Randy Sieffert. 2009. Validating a standardized usability/user-experience maturity model: A progress report. In *International Conference on Human Centered Design*, Springer, 104–109.

[27] Nicola Marsden and Maren Haag. 2016. Stereotypes and Politics: Reflections on Personas. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16), ACM, San Jose, USA, 4017–4031. DOI: https://doi.org/10.1145/2858036.2858151

[28] Nicola Marsden and Monika Pröbster. 2019. Personas and Identity: Looking at Multiple Identities to Inform the Construction of Personas. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*, ACM Press, Glasgow, Scotland Uk, 1–14. DOI: https://doi.org/10.1145/3290605.3300565

[29] Nicola Marsden, Monika Pröbster, Mirza Ehsanul Haque, and Julia Hermann. 2017. Cognitive styles and personas: designing for users who are different from me. In *Proceedings of the 29th Australian Conference on Computer-Human Interaction*, ACM, Brisbane, Queensland, Australia, 452–456.

[30] Tara Matthews, Tejinder Judge, and Steve Whittaker. 2012. How Do Designers and User Experience Professionals Actually Perceive and Use Personas? In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '12), ACM, Austin, Texas, USA, 1219–1228. DOI: https://doi.org/10.1145/2207676.2208573

[31] Tara Matthews, Steve Whittaker, Thomas Moran, and Sandra Yuen. 2011. Collaboration personas: A new approach to designing workplace collaboration tools. In *Proceedings of the SIGCHI conference on human factors in computing systems*, 2247–2256.

[32] Steve Mulder and Ziv Yaar. 2006. *The User is Always Right: A Practical Guide to Creating and Using Personas for the Web*. New Riders.

[33] Lene Nielsen. 2019. *Personas - User Focused Design* (2nd ed. 2019 edition ed.). Springer, New York, NY, USA.

[34] Lene Nielsen, Kira Storgaard Hansen, Jan Stage, and Jane Billestrup. 2015. A Template for Design Personas: Analysis of 47 Persona Descriptions from Danish Industries and Organizations. *International Journal of Sociotechnology and Knowledge Development* 7, 1 (January 2015), 45–61. DOI: https://doi.org/10.4018/ijskd.2015010104

[35] Lene Nielsen and Kira Storgaard Hansen. 2014. Personas is applicable: a study on the use of personas in Denmark. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM, Toronto, Ontario, Canada, 1665–1674.

[36] James E. Nieters, Subbarao Ivaturi, and Iftikhar Ahmed. 2007. Making personas memorable. In *CHI '07 extended abstracts on Human factors in computing systems - CHI '07*, ACM Press, San Jose, CA, USA, 1817. DOI: https://doi.org/10.1145/1240866.1240905

[37] John Pruitt and Jonathan Grudin. 2003. Personas: Practice and Theory. In *Proceedings of the 2003 Conference on Designing for User Experiences* (DUX '03), ACM, San Francisco, California, USA, 1–15. DOI: https://doi.org/10.1145/997078.997089

[38] Ana Lucia de Queiroz Tourinho, Otávio P. Sanchez, and Susan A. Brown. 2019. Measuring the Organizational analytical Competence: Development of a Scale. In *ECIS*.

[39] Balasubramani Ramaseshan, Russel Philip Kingshott, and Alisha Stein. 2015. Firm self-service technology readiness. *Journal of service management* (2015).

[40] Kari Rönkkö. 2005. An Empirical Study Demonstrating How Different Design Constraints, Project Organization and Contexts Limited the Utility of Personas. In *Proceedings of the Proceedings of the 38th Annual Hawaii International Conference on System Sciences - Volume 08* (HICSS '05), IEEE Computer Society, Washington, DC, USA. DOI: https://doi.org/10.1109/HICSS.2005.85

[41] Kari Rönkkö, Mats Hellman, Britta Kilander, and Yvonne Dittrich. 2004. Personas is Not Applicable: Local Remedies Interpreted in a Wider Context. In *Proceedings of the Eighth Conference on Participatory Design: Artful Integration: Interweaving Media, Materials and Practices - Volume 1* (PDC 04), ACM, Toronto, Ontario, Canada, 112–120. DOI: https://doi.org/10.1145/1011870.1011884

[42] Joni Salminen, Kathleen Guan, Soon-gyo Jung, Shammur Absar Chowdhury, and Bernard J. Jansen. 2020. A Literature Review of Quantitative Persona Creation. In *CHI '20: Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, ACM, Honolulu, Hawaii, USA, 1–14. DOI: https://doi.org/10.1145/3313831.3376502

[43] Joni Salminen, Bernard J. Jansen, Jisun An, Haewoon Kwak, and Soon-gyo Jung. 2018. Are personas done? Evaluating their usefulness in the age of digital analytics. *Persona Studies* 4, 2 (November 2018), 47–65. DOI: https://doi.org/10.21153/psj2018vol4no2art737

[44] Joni Salminen, Soon-gyo Jung, Shammur Absar Chowdhury, Sercan Sengün, and Bernard J Jansen. 2020. Personas and Analytics: A Comparative User Study of Efficiency and Effectiveness for a User Identification Task. In *Proceedings of the ACM Conference of Human Factors in Computing Systems (CHI'20)*, ACM, Honolulu, Hawaii, USA. DOI: https://doi.org/10.1145/3313831.3376770

[45] Joni Salminen, Soon-gyo Jung, João M. Santos, Shammur Chowdhury, and Bernard J. Jansen. 2020. The Effect of Experience on Persona Perceptions. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems Extended Abstracts* (CHI '20), Association for Computing Machinery, Honolulu, HI, USA, 1–9. DOI: https://doi.org/10.1145/3334480.3382786

[46] Joni Salminen, Ilkka Kaate, Ahmed Mohamed Sayed Kamel, Soon-gyo Jung, and Bernard J. Jansen. 2020. How Does Personification Impact Ad Performance and Empathy? An Experiment with Online Advertising. *International Journal of Human–Computer Interaction* 0, 0 (August 2020), 1–15. DOI: https://doi.org/10.1080/10447318.2020.1809246

[47] Jeff Sauro, Kristin Johnson, and Chelsea Meenan. 2017. From snake-oil to science: measuring UX maturity. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, 1084–1091.

[48] Cathrine Seidelin, A. Jonsson, M. Høgild, J. Rømer, and P. Diekmann. 2014. Implementing personas for international markets: a question of UX maturity. In *Proceedings at SIDER*.

[49] Phillip Douglas Stevenson and Christopher Andrew Mattson. 2019. The Personification of Big Data. *Proceedings of the Design Society: International Conference on Engineering Design* 1, 1 (July 2019), 4019–4028. DOI: https://doi.org/10.1017/dsi.2019.409

[50] Viswanath Venkatesh, James YL Thong, and Xin Xu. 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly* (2012), 157–178.

[51] Gabriela Viana and Jean-Marc Robert. 2016. The practitioners' points of view on the creation and use of personas for user interface design. In *International Conference on Human-Computer Interaction*, Springer, 233–244.

[52] Bernhard Wöckl, Ulcay Yildizoglu, Isabella Buber, Belinda Aparicio Diaz, Ernst Kruijff, and Manfred Tscheligi. 2012. Basic Senior Personas: A Representative Design Tool Covering the Spectrum of European Older Adults. In *Proceedings of the 14th International ACM SIGACCESS Conference on Computers and Accessibility* (ASSETS '12), ACM, New York, NY, USA, 25–32. DOI: https://doi.org/10.1145/2384916.2384922

[53] Xiang Zhang, Hans-Frederick Brown, and Anil Shankar. 2016. Data-driven Personas: Constructing Archetypal Users with Clickstreams and User Telemetry. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16), ACM, San Jose, California, USA, 5350–5359.

[54] Yali Zhang, Jun Sun, Zhaojun Yang, and Ying Wang. 2020. Critical success factors of green innovation: Technology, organization and environment readiness. *Journal of Cleaner Production* (2020), 121701.