A Questionnaire to Measure Six Attributes of a UX Capability and Maturity Model: A Preliminary Study

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Abstract. Delivering a positive user experience (UX) is key for system adoption, as users may abandon systems that hinder task completion or create frustration. Despite recognition of UX benefits, integrating UX practices into development remains a challenge. UX capability and maturity models help identify areas for improvement, but few offer practical tools or are empirically validated. This paper presents an extension of a questionnaire to assess UX maturity, adding dimensions on execution of UX processes (analysis, specification, design, evaluation) and organisational capabilities (UX staff and integration of UX). Data was collected from 20 UX practitioners to examine how well the instrument captures maturity differences across organisational settings. Results suggest that both qualitative and quantitative responses reflect maturity-specific challenges.

Keywords: UXCMM · UX maturity assessment · questionnaire · UX processes

1 Introduction

Delivering a positive user experience (UX) is crucial to system adoption, as users may abandon systems that hinder task completion or create frustration [2,11]. UX refers to users' perceptions and responses resulting from the use or anticipated use of a system [11]. It includes both pragmatic aspects, such as usability and task completion, as well as hedonic aspects, such as aesthetics and engagement [9].

Despite growing interest in UX and increasing recognition of its benefits, integrating UX practices into development remains a challenge in many organisations [4,10]. While studies highlight the positive return on investment (ROI) of UX, including improved product quality, reduced development costs, and increased user satisfaction, these advantages often fail to translate into sustained organisational commitment. Barriers include resource constraints, unclear roles, lack of management buy-in, and the misconception that UX concerns are limited to interface design [4].

UX capability and maturity models (UXCMMs) are intended to address these integration challenges by assessing how UX processes are implemented and highlighting areas for improvement [19]. Most models define process stages and maturity levels to

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help organisations track their progress and align practices with strategic goals. However, the adoption of UXCMMs remains limited, as few provide practical assessment tools or have undergone robust empirical validation [10,19]. Many models focus narrowly on usability and are poorly integrated with broader software development processes [19]. Assessment procedures are often insufficiently detailed [15], and most models include capability or maturity scales without offering clear guidance or instruments for implementation [19,27].

In this paper, we develop a questionnaire to assess the execution of UX processes and organisational capabilities, key components of UX maturity. We report on a first round of data collection to explore the questionnaire's ability to capture maturity differences across organisational contexts.

2 Background and Related Work

2.1 HCD and UX

ISO [11] defines human-centred design (HCD) as an approach to system design and development that aims to make interactive systems more usable by focusing on how the system is used, drawing on knowledge from human factors, ergonomics, and usability. HCD involves four key activities that align with the main development stages: analysing the context of use, specifying user requirements, designing solutions, and evaluating those solutions. These activities can be conducted early, before requirements are finalised.

UX is defined as "user's perceptions and responses that result from the use and/or anticipated use of a system, product or service" [11]. UX covers pragmatic and hedonic aspects of interaction [9]. Pragmatic attributes relate to usability, efficiency, and functionality, while hedonic attributes relate to emotion, aesthetics, and enjoyment. Good UX design balances both to meet user needs and create engaging experiences.

2.2 UXCMM

Organisations can be positioned along a continuum ranging from immature to mature [24]. Organisations with low levels of maturity tend to be reactive, focused primarily on addressing immediate crises, budgets are frequently exceeded, and quality is often compromised to meet deadlines. In contrast, mature organisations have a proactive approach, in which product quality is planned and monitored, project goals are generally achieved, and budget estimates are accurate.

UX capability and maturity models (UXCMMs) help assess an organisation's UX processes and provide information to improve them. Organisational process maturity is defined as the extent to which an organisational unit consistently implements processes within a defined scope that contributes to the achievement of its business needs [13], while process capability refers to the ability to perform those processes [12]. UXCMMs should include a process reference model [15], a process assessment model, and a set of scales to measure capability or maturity [19]. Capability scales measure the extent to which UX processes meet their goals, while maturity scales characterise an organisations overall UX maturity based on maturity attributes.

Most UXCMMs follow six-level maturity scale [25,27] defined in [7], including [12]. Although the wording varies, the levels correspond to: X/0 (Unrecognised), A/1 (Recognised), B/2 (Considered), C/3 (Implemented), D/4 (Integrated), and E/5 (Institutionalised). At level X, organisations have no UX processes and therefore cannot be assessed. At level A, stakeholders recognise the need to improve development due to poor UX outcomes, but processes are inconsistent. At level B, they value quality of use, promote training, and start considering user requirements. At level C, appropriate UX processes and techniques are implemented at the project level. At level D, UX is integrated into the development model, with allocated resources and access to UX artefacts. At level E, organisations are UX-driven and use UX to enhance both internal and external product value, treating UX concerns on par with other system issues.

UX maturity models have evolved along two main lines: some adopt expert-led, evidence-based assessments, while others rely on self-administered tools designed for quick diagnostics within organisations. Despite methodological differences, their shared goal is to assess how deeply UX is embedded across organisational culture, resources, and practices. Among the most established models, [15] introduced a pioneering framework with six maturity levels based on structured documentation review and stakeholder interviews. Another model built on this by defining twelve key usability engineering process areas, assessed via guided interviews and precise rating rules [22].

By contrast, models like [18,26] offer standardised questionnaires filled in by internal stakeholders or UX experts, streamlining the assessment while maintaining conceptual depth. A more exploratory approach is proposed by [21], who developed a qualitative framework based on open-ended questions to investigate organisational UX capacity across multiple dimensions, without assigning numerical scores or maturity levels. Finally, [1] integrates both quantitative (survey) and qualitative (interviews and observations) data. Their model addresses agile-specific concerns and incorporates emergent dimensions such as attitudes, return on investment, and organisational barriers, offering a context-sensitive view of UX maturity in agile environments.

3 Method

3.1 Objectives

This study aims to develop a method for assessing UX maturity through a questionnaire composed of open-ended questions as well as closed-ended questions linked to a five-level maturity scale. Participants select the option that best describes their context; responses are then converted into numerical scores. Specifically, we pursue three objectives: (1) extend the questionnaire developed by [1], (2) collect a first set of empirical data to examine whether the questionnaire functions as intended, and (3) inform future iterations and validation efforts. The revised structure is designed to enable comparisons between what participants report knowing, what they claim to do, and, eventually, what they are observed doing in real-world settings.

3.2 Instrument Development

We extend the questionnaire developed by [1], which was designed to assess UX literacy across six dimensions. To expand the questionnaire beyond knowledge and beliefs,

we developed six dimensions, each corresponding to a specific attribute of UX maturity. Two new dimensions capture organisational capabilities: INT (integration of UX into development processes) and STA (UX staffing). These dimensions draw on a combination of issues identified in literature and insights from field data, such as limited or untrained staff and tensions related to the integration of UX practices within existing organisational structures. Four dimensions capture the execution of UX processes: ANA (context of use analysis), SPE (requirements specification), DES (solution design), and EVA (solution evaluation). The execution of UX processes attributes align with the HCD process"execute" category (HCP.3) defined in [14]. The aim is to assess the extent to which these processes are planned, managed, and effectively carried out within organisations. Table 1 presents the items for each dimension, their structure and associated UX maturity levels. In the following, we refer to execution of UX processes and organisational capability as questionnaire components, ANAEVA and INTSTA as questionnaire dimensions, and individual questions as items.

We retained the 5-point Likert scale defined in [1], as level 0 (unrecognised) exclusively corresponds to organisations with no UX processes in place, which therefore cannot be meaningfully assessed. At the end of each dimension, following the close-ended questions, we included two open-ended questions: (1) what would explain your overall responses for this section? and (2) what would help to improve this process?. These open-ended questions were intended to capture, in the participants' own words, the underlying reasons behind their responses and to provide contextual insight into how the reported practices and capabilities are experienced in practice.

3.3 Sample Participants

The study involved 20 participants. Eighteen (P01-P18) were master's students enrolled in a UX-focused work-study programme, alternating between academic coursework and internships. The remaining two participants (P19 and P20) were UX professionals who also teach at this programme. All participants had a solid background in UX, resulting in a relatively homogeneous sample in terms of UX-related knowledge. Participants worked for at least a year in organisations of varying sizes: ten in organisations with fewer than 10 employees, six in organisations with 11 to 50 employees, one in an organisation with 51 to 250 employees, and three in organisations with more than 250 employees. Most (75%) were part of UX teams composed of one to two members, while the remaining worked in teams of three to five. As a result, the way UX is structured and resourced in these organisations likely differs, which may influence how maturity is perceived or reported.

3.4 Individual Sessions

Each participant individually completed the questionnaire, which included closed-ended questions for each dimension. For each question, participants selected the option that best described their situation and provided a brief written justification for their choice at the dimension level (not for each individual question). The questionnaire was implemented and administered via the Moodle platform. All participants read and signed a consent form prior to participation. We collected 20 complete responses.

Table 1. UXCMM items and maturity anchors (Levels A–E).

Item	Question	Level A (recognised)	Level B (considered)	Level C (implemented)	Level D (integrated)	Level E (institutionalised)
ANA1	What types of methods do you use for UX analysis?	No UX-specific methods used	Mostly declarative (e.g. interviews), expert reviews (e.g. guidelines), and observational	Mostly contextual inquiry, supported by declarative, observational and expert reviews	Ethnographic methods and digital anthropology used for exploratory or innovation projects	Advanced qualitative and quantitative methods used across lifecycle stages; innovation supported by diverse UX research
ANA2	Are UX methods chosen based on research objectives?	No formal research objectives	Research objectives defined, but UX methods selected based on convenience	Methods strategically selected to meet research objectives	Methods systematically aligned with research objectives and integrated into decision-making	Organisational guidelines ensure methods are consistently selected based on research goals
ANA3	What best qualifies the data collected through UX analysis?	Ad-hoc data: user data exists but is not used	Formal data collection, but with irregular resources and therefore varying quality	Formal data collection with regular resources and good quality	User data cross-analysed with data from other projects to identify broader insights	UX data is systematically documented and reused across projects to guide strategy and design
ANA4	How are UX analysis findings acted upon?	Findings are not formally captured or used	Findings are acknowledged but not consistently acted upon	Findings are used to improve the system throughout development	Findings inform multiple design or development initiatives	Findings are systematically reused and inform multiple projects or strategic decisions
ANA5	How regularly is UX analysis conducted?	Conducted once or irregularly	Planned in a few projects	Planned in all projects	Integrated into development lifecycle	Ongoing UX monitoring with dedicated analysis pipelines
SPE1	What best qualifies the way user requirements are specified?	Not specified	Some UX artefacts are used to specify user requirements	User requirements fully specified through appropriate representations	User requirements are continuously improved based on user feedback	User requirements are embedded in organisational standards and reused across products or projects
SPE2	To what extent are user requirements understood and used?	Staff recognise a need to improve the UX of the systems	Staff recognise that user needs matter	Staff apply user requirements with the support from UX staff	Staff understand and independently use user requirements	C-level staff consult user requirements to guide investment decisions, product priorities, and strategic roadmaps
SPE3	To what extent is the system tested and refined based on user requirements?	The system is not tested against user requirements	Test-and-refine is initiated but not applied systematically	Test-and-refine continues until user requirements are met	Test-and-refine is improved using specified user requirements to monitor and track progress across iterations	UX validation against user requirements is monitored through governance processes (e.g. design control boards, compliance checkpoints)
SPE4	Which data feed UX artefacts and user requirements?	No input: data may be collected, but not used to define user requirements	General input: based on usability guidelines, best practices, or empirical data	Systematic input: derived from structured UX analysis and evaluation	Iterative refinement: continuously updated based on feedback and analytics	User-driven: user data from across projects actively shapes product direction and specifications
SPE5	How are user needs traced throughout the UX process?	No traceability; user needs are noted but disconnected from later stages	Some user needs are manually carried over into requirements	User needs are documented and referenced in requirements documents	User needs improve design elements and inform test scenarios	Traceability is maintained across the lifecycle through linked artefacts (e.g. UR → wireframes → tests)

(*continued*)

Table 1. (*continued*)

Item	Question	Level A (recognised)	Level B (considered)	Level C (implemented)	Level D (integrated)	Level E (institutionalised)
DES1	How are UX goals used during the design process?	No goals defined	General usability goals are used as design guidelines	Design aligned with UX goals derived from UX analysis	UX goals directly guide design iterations and trade-offs	UX goals embedded in design KPIs, success metrics, and acceptance criteria
DES2	How are UX design outcomes used?	No actual design outcomes	UX design occasionally documented	UX design outcomes directly feed into the user requirements; development teams follow them with UX support	Development teams independently apply UX design instructions from the user requirements	Centralised, versioned UX design repository actively used across design and development teams
DES3	How consistent is design across systems/features?	No consistency	No formal approach to ensure consistency	Use of style guide	Use of organisational style guide	Governance body ensures alignment across platforms; enforced design system in place
DES4	Which data inform UX design choices?	Based on intuition or data from non-users	Mixed data from non-users and end users	User data gathered during UX analysis and evaluation	Triangulated data (UX analysis, prior evaluations, user goals)	UX design systematically integrates strategic user data streams (e.g. real-time analytics, longitudinal studies, support logs) curated to inform cross-product and organisational-level design decisions
EVA1	How is user testing conducted?	No formal user testing or only guerilla mode	Lab or remote testing	Full range of methods (lab, guerilla, remote, field) used adequately		
EVA2	What methods do you use for UX evaluation?	No formal method used	Mostly task-based user testing or expert reviews (e.g. heuristic)	Iterative user testing combining multiple methods (e.g. emocards, interviews, standardised questionnaires)	A/B testing or instrument-based experiment (e.g. eye tracking, face reader)	Longitudinal or cause-and-effect studies
EVA3	Which representation of the system is used for UX evaluations?	Final system or fully functioning prototype	Mostly medium-fidelity prototypes (e.g. interactive wireframe, Wizard-of-Oz)	Prototype fidelity is selected based on the development phase (early versus late)	Prototype fidelity is selected based on the evaluation objectives (formative versus summative)	Use conceptual models (e.g. sequence model or task model) to test ideas
EVA4	What criteria are used for UX evaluation?	No specific criteria; personal impressions	Measurable usability criteria (task success, time on task), general heuristics	Large range of UX measures (e.g. attractiveness, efficiency, fun, etc.)	Evaluation criteria derived from UX goals and user requirements	Standardised evaluation criteria in place
EVA5	How are UX evaluation findings used?	Rarely used or only after deployment	Before release to prevent major issues	Issues are prioritised and guide iterations	Issues are tracked to resolution and re-tested	Ongoing UX monitoring with dedicated evaluation pipelines
INT1	Who performs UX processes?	Developers	UX designers	UX researchers and UX managers	UX processes are led by multidisciplinary teams including UX, product, and development roles	UX processes are coordinated across departments and supported by executive leadership (e.g. VP UX, C-level)

(*continued*)

Table 1. (*continued*)

Item	Question	Level A (recognised)	Level B (considered)	Level C (implemented)	Level D (integrated)	Level E (institutionalised)
INT2	When are UX processes performed?	When UX problems occur or upon request	During development or maintenance	Continuously throughout the development lifecycle	UX processes are embedded in continuous delivery cycles	UX processes are proactively planned and synchronised with business strategy and product roadmaps
INT3	How are participants sampled for UX activities?	Among internal employees or clients	Among representative and non-representative end-users	Among user representatives and end-users	Systematically recruited to match user segments and use contexts	Participant panels are maintained and reused to ensure continuity and strategic relevance
INT4	What is the scope of UX integration?	A small number of projects	More than half of the projects	Almost all projects, with very few exceptions	Systematic across all projects, including internal tools and legacy systems	Embedded in organisational standards, procurement, and governance processes
INT5	What is the purpose of UX integration?	Fix major UX issues in systems or products	Limit major UX issues in systems or products	Avoid UX issues in systems or products	Improve UX processes	Define future projects
STA1	Which UX roles are present in your organisation?	No UX staff	UX designer (or web/graphic)	UX designer, UX researcher, UX manager	UX designer, UX researcher, UX manager, UX trainer, UX strategist	UX roles are diversified, formally recognised in HR structures, and involved in strategic governance (e.g. VP UX, Chief Experience Officer)
STA2	What is the academic background of the UX staff?	No UX staff	Design or Computer Science	UX or HCI	UX, HCI, Anthropology, Sociology	UX staff come from interdisciplinary backgrounds and contribute to internal research programmes
STA3	What kind of UX training is implemented in your organisation?	Self-training	External training	Targeted internal training (e.g. UX staff)	Generalised internal training (e.g. developers)	UX training is embedded in organisational onboarding, leadership development, and continuous learning programmes, accessible to all roles
STA4	What is the designer–developer ratio in your organisation?	No designers (ratio = 0)	1–2 designers max (ratio < 0.1)	1 designer for 2 developers (ratio = 0.5)	As many designers as developers (ratio = 1)	Balanced ratio maintained across teams and monitored as a strategic KPI
STA5	What is the turnover level among UX staff in your organisation?	High: short-term consultants	High: short-term consultants, UX staff understaffed	Medium: understaffing addressed, consultants rarely needed	Low: UX staff build their career in the organisation	UX staff retention is actively supported through clear career paths, internal mobility, and involvement in long-term vision and strategy

3.5 Data Analysis

Descriptive analysis is based on recoding participant responses. For each closed-ended question, the selected UX maturity level (from A to E) was converted into a numerical score from 1 (A) to 5 (E). This allows us to compute indicative scores for the execution of UX processes in their organisations and the organisational capabilities supporting UX. We performed descriptive statistics on these scores, including distributions, means, standard deviations, and medians.

Psychometric analysis is based on a calculation of the internal consistency of each dimension using Cronbach's α statistical index [6], item-level analyses and exploratory factor analysis. Cronbach's α is a common way of assessing the reliability of a questionnaire, defined as the degree to which measurements are free from error and produce consistent results. It is generally accepted that an α greater than or equal to .70 is the threshold at which the first versions of a questionnaire can be considered satisfactory [23]. Item-level analyses examine changes in Cronbachs α when individual items were removed, in order to assess each items contribution to internal consistency. Exploratory factor analysis examines the structure of the questionnaire dimensions. This exploratory factor analysis uses principal axis factoring with oblimin rotation. Factor retention is informed by parallel analysis and inspection of the scree plot.

Thematic analysis focuses on participants' written reasoning provided at the dimension level for execution of UX processes and organisational capability components. We applied thematic analysis outlined in [3] to identify recurring themes and subthemes, aiming to contextualise and qualify the quantitative results. We bring these two data sources together in the discussion (Sect. 5), where we examine how declared scores align–or misalign–with participants stated reasoning.

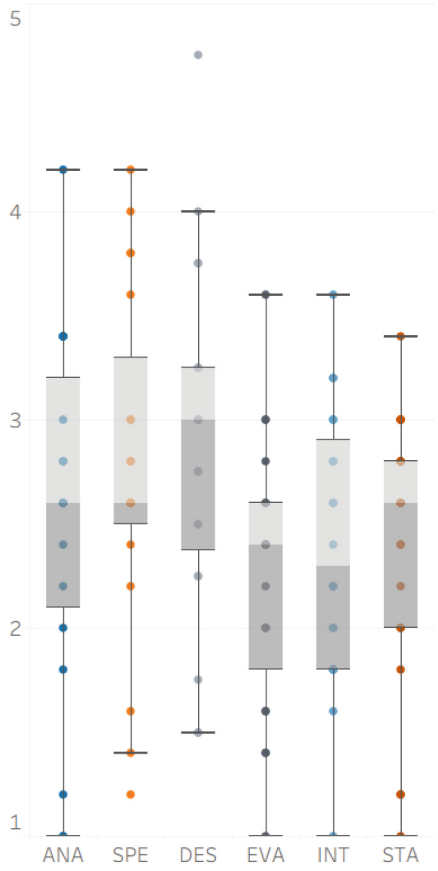
4 Results

4.1 Descriptive Analysis

Figure 1-left shows the distribution of participant scores for each dimension. Figure 1-right shows individual mean scores by participant (rows) and by dimension (columns). Figure 2 shows the distribution of participant responses across all individual items in the questionnaire, grouped by dimension.

Execution of UX Processes. Survey scores vary widely between participants for the dimensions of the execution of UX processes component (Fig. 1-left). The range spans up to four points for almost every dimension, and averages and standard deviations do not reflect the variability in how UX processes are implemented. DES has the smallest total range and the tightest interquartile range. Figure 1-right shows that 55% of participants have a mean above 3 for DES, compared to 30% for ANA, 35% for SPE and 15% for EVA. DES receives the highest score (M = 4.75) and is the top-rated dimension for 45% of participants. In contrast, EVA is the lowest-rated dimension for 70% of participants.

Figure 2 shows that some item scores stand out by being particularly high or low. ANA5, DES3, EVA1 and STA5 differ by more than 0.35 from the next closest item in



	DES	SPE	ANA	EVA	STA	INT	Mean
P04	4,75	4,20	4,20	3,00	3,00	3,60	3,76
P19	3,75	3,00	3,00	3,60	3,00	2,60	3,14
P20	3,75	4,00	3,40	3,00	1,20	2,80	3,00
P01	3,25	3,60	2,80	2,40	2,60	3,00	2,93
P17	2,75	2,60	3,40	2,00	3,40	3,20	2,90
P15	3,00	2,60	3,40	2,60	3,00	2,60	2,86
P14	3,00	3,80	3,40	2,20	2,20	2,20	2,79
P03	3,00	2,80	2,80	2,40	2,60	3,20	2,79
P08	3,00	2,60	2,60	2,60	2,80	2,80	2,72
P10	2,25	3,80	2,60	2,80	1,80	2,40	2,62
P05	4,00	2,60	2,60	2,40	2,40	1,80	2,59
P13	3,25	2,80	2,00	2,00	2,00	3,00	2,48
P02	2,75	2,40	2,40	2,40	2,80	2,00	2,45
P18	2,50	2,60	2,20	2,00	2,40	2,20	2,31
P07	2,25	3,00	2,60	2,60	1,20	1,80	2,24
P16	3,25	2,60	2,60	1,40	1,00	1,80	2,07
P11	2,50	1,60	1,20	1,00	2,80	1,60	1,76
P12	1,75	2,20	1,80	1,60	2,00	1,00	1,72
P09	1,50	1,40	1,00	1,60	2,60	1,80	1,66
P06	1,50	1,20	1,00	1,40	2,80	2,00	1,66
Mean	2,89	2,77	2,55	2,25	2,38	2,37	2,52

Fig. 1. Descriptive analysis of UX maturity scores. Left: Dimension boxplots. Right: Highlight table showing mean scores per participant and per dimension, sorted in descending order.

their group and by at least 0.7 from the furthest item. ANA5, which asks how regularly UX analysis is conducted, receives a notably lower score than the other ANA items (M = 2.15, SD = 1.11). DES3, which asks whether design standards or guidelines are applied across systems and features, scores higher than the other DES items (M = 3.35, SD = 0.96). EVA1, which asks how user testing is conducted, also stands out with a particularly low score (M = 1.65, SD = 0.73).

Organisational Capability. Overall, organisational capability (INT and STA) is the lowest-scoring component across all figures. Most participants score below 3 for STA (90%) and INT (80%), with about one third scoring below 2 for both dimensions (Fig. 1-left). These results are confirmed in the highlight table (Fig. 1-right), where STA and INT show the second lowest mean values across participants. Notably, the only cases where STA scores 3 or above also show similar levels for INT, suggesting some inter-dependence in how UX is resourced and integrated.

Item-level distributions (Fig. 2) reveal no clear outlier among INT or STA items, except for STA5, which relates to UX staff turnover and shows a higher mean ($M = 3.35$, $SD = 1.19$), indicating moderate to low turnover in most cases. Overall, these findings suggest a lack of stable organisational support for UX.

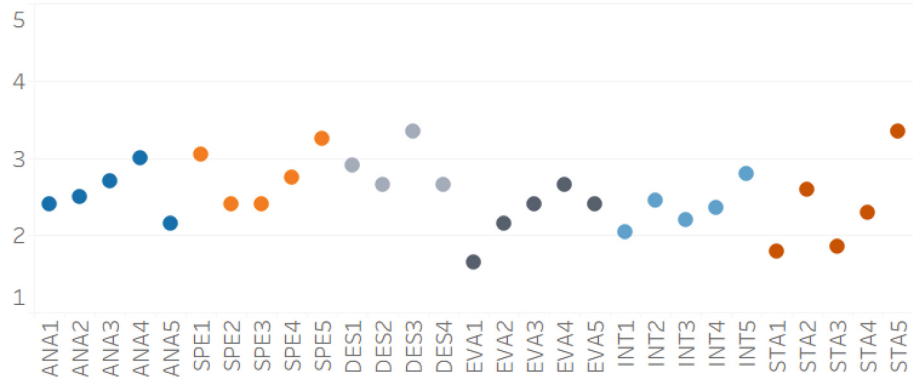


Fig. 2. Mean score for each survey item.

4.2 Psychometric Analysis

The psychometric analysis of internal consistency calculated using Cronbach's α highlights several strengths and areas of improvement in the questionnaire (Table 2. First, the analysis of the components reveals organisational capability scores are moderate but close to the 0.70 threshold (α = 0.680), and execution of UX processes scores very satisfactorily ($\alpha = 0.913$). The α for the dimensions of execution of UX processes (ANA = 0.777, SPE = 0.735, DES = 0.705, EVA = 0.661) are all satisfactory or almost satisfactory. The dimensions of organisational capability (INT = 0.603, STA = 0.579) do not meet the requirements to guarantee good reliability.

Table 2. Reliability of component and dimension.

Component	α	Dimension	α
Execution of UX processes	0.913	ANA	0.777
		SPE	0.735
		DES	0.705
		EVA	0.661
organisational capability	0.680	INT	0.603
		STA	0.579

An analysis of item reliability statistics was conducted to further examine internal consistency at the item level for both execution of UX processes' and organisational capability's dimensions. For the execution of UX processes' dimensions (Table 3), all items display acceptable values of Cronbachs α if item dropped, with most values remaining above .60 and several exceeding .70. For ANA and SPE, the removal of any single item would result in a decrease in Cronbachs α, indicating that all items contribute positively to internal consistency. For DES, removing item DES4 would increase Cronbachs α from .705 to .761. For EVA, removing EVA4 would marginally increase Cronbachs α.

For the organisational capability (Table 4), examining changes in Cronbachs α following the removal of individual items shows only limited variation in internal consistency across dimensions. For INT, removing item INT1 results in a minimal increase in Cronbachs α, while the removal of INT5 leads to a slightly larger, though still modest, increase. For STA, removing item STA3 produces a small increase in Cronbachs α.

Table 3. Frequentist individual item reliability statistics for execution of UX processes dimensions.

Item	If item dropped Cronbach's α	Item	If item dropped Cronbach's α	Item	If item dropped Cronbach's α	Item	If item dropped Cronbach's α
ANA1	0.737	SPE1	0.643	DES1	0.627	EVA1	0.647
ANA2	0.704	SPE2	0.724	DES2	0.587	EVA2	0.546
ANA3	0.759	SPE3	0.717	DES3	0.584	EVA3	0.570
ANA4	0.746	SPE4	0.698	DES4	0.761	EVA4	0.664
ANA5	0.733	SPE5	0.645			EVA5	0.605

Table 4. Frequentist individual item reliability statistics for organisational capability dimensions.

Item	If item dropped Cronbach's α	Item	If item dropped Cronbach's α
INT1	0.615	STA1	0.462
INT2	0.382	STA2	0.497
INT3	0.485	STA3	0.599
INT4	0.574	STA4	0.550
INT5	0.624	STA5	0.503

Finally, an exploratory factor analysis using principal axis factoring with oblimin rotation was conducted on the execution of UX processes (ANA, SPE, DES, EVA) items and another on the organisational capability (INT, STA) items. For execution of UX processes, parallel analysis indicated the retention of a single factor and all items

loaded on this factor with loadings above .40. The factor had an eigenvalue of 7.46 and explained 36.1% of the total variance. For organisational capability, parallel analysis based on factor analysis indicated the retention of three factors and all retained factors were defined by loadings exceeding .40. The three-factor solution explained 57.1% of the total variance.

4.3 Thematic Analysis

Themes. The analysis of participants' written reasoning revealed seven major themes, around 80 sub-themes for 227 entries. *Quality of processes* concerns whether UX work is structured, iterative, and user-centred, or ad hoc and inconsistent. *Budget / Resources* covers lack of time, staff, tools, and funding. *Internal Awareness/Training* relates to low UX knowledge, limited ROI awareness, and resistance to change within organisations. *External Awareness/Training* addresses the same issues on the client side. *Strategy* concerns whether UX is valued, prioritised, and supported, or marginalised and rushed. *Team / Collaboration* covers dynamics between UX roles, stakeholders, and developers, as well as the isolation of UX roles and lack of UX management. *Documentation* reflects issues with coherence, reuse, and accessibility of UX artefacts and UX findings.

Subthemes. Despite the large number of subthemes, ten account for 49% (112) entries. The most frequent sub-theme is *insufficient UX staff* (27 entries), which mainly accounts for situations where a single person carries all UX responsibility (P02, P07, P11, P12, P14, P16) or lacks specialist colleagues (P10, P14, P15, P17). For *insufficient UX knowledge* (22), participants describe situations where UX is welcomed in principle but not understood (P04, P14, P16, P18), report limited understanding of UX and UX roles within the organisation (P03, P06, P09, P14, P15, P19), mention that UX findings and work are disregarded (P16), and note difficulties convincing clients of UX value (P02, P03, P15, P19). Some refer specifically to challenges selling UX to clients (P06) or having to redirect UX resources to non-UX tasks (P19). *Insufficient UX resources* (11) includes tight budgets (P02, P04, P09, P15, P16, P17, P18) and limited infrastructure for user research or testing (P15, P16, P20).

Other recurrent sub-themes include *insufficient time* (9), which points to schedule constraints that limit the use of UX activities (P07, P08, P13, P14, P17, P20) and *insufficient user involvement* (8) which reflects limited access to users (P01, P04, P08, P09, P10, P12, P13, P15). *UX is ad hoc* (8) describes informal or reactive UX activity (P01, P04, P11, P12, P16), while *no UX process* (8) refers to the absence of a structured UX methodology altogether (P06, P09, P11, P12). *Insufficient UX evaluation* (7) accounts for situations where UX evaluation was limited (P02, P07, P08, P09, P18) or left to the client (P03). *Need to use quick, cheap methods* (6) accounts for the pressure to reduce UX work through low-cost approaches (P07, P12, P15, P18, P20). *Resistance to change (UX)* (6) refers to the reluctance to use UX findings or change established routines (P04, P06, P09, P14, P17, P18).

5 Discussion

5.1 Questionnaire Improvement

The results presented in Sect. 4.2 show that the execution of UX processes component has generally satisfactory internal consistency and does not require substantial revision at this stage. Most items contribute positively to internal consistency, especially within the ANA and SPE dimensions, where removing any single item would lead to a decrease in Cronbachs α. For the EVA dimension, internal consistency is slightly lower, but item-level analyses show only marginal changes in α when individual items are removed. This indicates that no EVA item warrants priority investigation. However, in the DES dimension, removing item DES4 would lead to a non-trivial increase in Cronbachs α. This item, which asks Which data inform UX design choices?, behaves differently from the other design-related items and therefore deserves closer examination in future versions of the questionnaire. At the structural level, the exploratory factor analysis identifies a single factor for the execution of UX processes component. The variance shared by ANA, SPE, DES, and EVA items is best captured by a single factor, which is consistent with the high overall internal consistency of this component (Cronbachs α = .913). Although these activities are conceptually distinct, the results suggest that they operate as a closely interrelated set of practices in the present data.

The organisational capability component shows weaker internal consistency and would benefit from further refinement. At the item level, removing INT1 or INT5 within the INT dimension, as well as STA3 within the STA dimension, results in small increases in Cronbachs α. However, these gains remain limited. Even if these items were removed, overall reliability would remain only marginally satisfactory, indicating that item-level changes alone are unlikely to substantially improve internal consistency. At the structural level, the exploratory factor analysis identifies three factors for the organisational capability component. These factors do not align with the initial two-dimensional conceptualisation. Items from INT and STA load together across multiple factors, and only one factor is solely defined by STA items. This pattern indicates that the variance shared by organisational capability items is distributed across a more heterogeneous structure. As a result, future refinement should consider not only specific items such as INT1, INT5, and STA3, but also the broader dimensional organisation of the organisational capability component. The more complex factor structure observed for organisational capability aligns with its lower internal consistency, in contrast to the execution of UX processes component.

5.2 UX Maturity Levels

Although participants share similar challenges, grouping them by score profiles into UX maturity levels reveals distinct patterns in the types of problems they encounter. These groupings are not based on fixed quantitative cut-off points but reflect trends in score profiles and qualitative findings. As a result, some participants are positioned near the boundaries between maturity levels. Organisation size does not appear to influence the type or severity of these challenges, a finding consistent with [5]. Overall, participants describe limited access to users, reflected in low scores for EVA1. A lack of

resources, including staff and time, along with limited UX knowledge within organisations, emerges in nearly all cases. Most participants (85%) score below 3 in at least one execution of UX processes dimension, and 75% face challenges with at least two, despite having at least one UX staff member with UX knowledge. To account for these differences, we group participants into three UX maturity levels defined in [7]: recognised (level A), considered (level B), and implemented (level C). This classification reflects differences in mean scores for groups, which range from 1.7 (recognised) to 2.5 (considered) and 3 (implemented). Figure 3 presents the distribution of themes by UX maturity level.

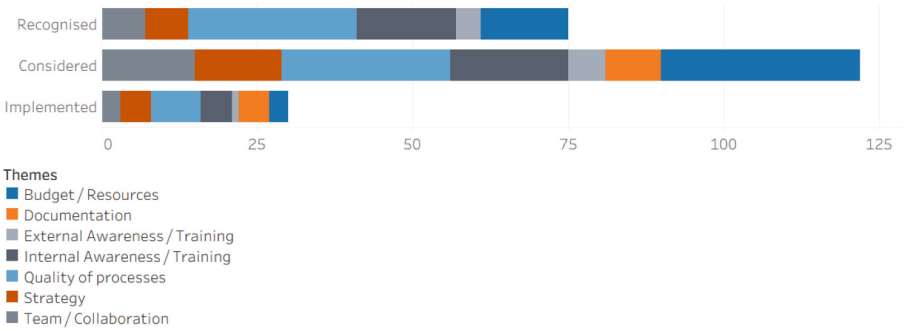


Fig. 3. Theme distribution by UX maturity level.

Recognised. Participants working in level A UX maturity contexts (P02, P06, P09, P11, P12, P18) work in settings where UX is marginal, as reflected in the low INT scores ($M = 1.7$). In the case of P12 and P18, UX is being introduced for the first time. While there is interest in integrating UX (P02, P06, P12, P18), follow-through remains limited. Consistent with low STA scores, participants report a lack of UX staff (P02, P06, P11, P12, P18), with some carrying full responsibility alone (P02, P11, P12). Resources are also limited (P02, P09, P11, P18), and participants frequently mention low UX knowledge (P06, P09, P18) and strong resistance to UX within the organisation (P06, P09, P18). These challenges are compounded by the invisibility of UX roles, a common issue in low-maturity contexts [16], often resulting in isolation and difficulty being heard [20]. With little support and minimal UX activity, two participants (P09, P11) report having found little value in their internship experience. Improving UX maturity in such contexts requires both commitment from top management and strategic orientation [8]. Further, education and training in UX help staff make informed decisions and are key to long-term integration [20].

The lack of formal UX process reference model is a key characteristic, as most participants describe having no structured process (P06, P09, P11, P12), or relying on ad hoc approaches (P11, P12). Others work with limited time or rely on quick, low-cost methods (P12, P18). UX is either introduced late (P11, P12) or limited to early phases (P18). Evaluation is often missing altogether (P02, P09, P18), and pragmatic

qualities are prioritised over hedonic ones (P02). Further, participants report difficulty in promoting UX to clients (P02), who have limited UX knowledge (P02, P06, P09, P18) or understanding of UX ROI (P02, P06), leading to a focus on client satisfaction over user needs (P06). As noted by [5], low UX maturity is linked to scarce resources, limited process understanding, and reluctance to commit to UX from the start of the project.

Considered. Participants working in level B UX maturity contexts (P01, P03, P05, P07, P08, P10, P13–17) score above 3 in at least two execution of UX processes dimensions, pointing to a fragmented or inconsistent implementation of UX. The main pain point for this group is lack of *budget/resources*. Several report limited infrastructure or budget (P15–17) and high time constraints that restrict UX activity (P07, P08, P17). Staffing is also insufficient (P10, P13, P14–17), with some working alone (P07, P14, P16). This aligns with consistently low STA score within the group, suggesting that organisational support is minimal.

Another pain point is the inconsistent *quality of process*. Participants report a limited or lack of user involvement (P01, P08, P10, P13, P15), which restricts user data collection across stages. This may stem from the lack of UX management, as having a dedicated practitioner to coordinate activities can facilitate user involvement [17]. In the absence of such roles, P01 and P16 describe UX as ad hoc, relying on improvised or opportunistic methods. When findings are not centralised or reused (P15, P16), continuity suffers and feedback loops weaken. P07 and P15 mention using quick, low-cost methods under pressure to remain economical. However, such methods provide an opportunity to introduce basic user involvement and challenge assumptions that management already understands users [5].

Participants also report gaps in UX evaluation (P03, P07, P08) and UX analysis (P08, P17), suggesting weak integration of early and late-stage UX activities. This is surprising, as literature indicates that clients often favour user testing over user research, assuming they already understand users' needs [5], but it aligns with [27], who notes that UX evaluation tends to occur more often in higher maturity levels. In contrast, design (DES) tends to receive higher scores, possibly because it is more tangible, easier to justify, or more widely understood within organisations. The difficulty in selling UX is a common challenge among practitioners [16], and raising awareness of UX ROI may help mitigate management distrust [5]. Further, the preference for DES may reflect how UX is still largely equated with visual design, especially in contexts where internal UX training is limited (P03, P05, P14). When clients lack UX knowledge (P03, P14–P16) and resist change (P03, P05), other UX practices become harder to justify or implement. However, when clients are aware of UX and user involvement ROI, they can positively influence internal practices and help motivate stakeholders to invest in UX [17].

Implemented. Participants working in level C UX maturity contexts (P04, P19, P20) report relatively mature UX processes, with at least three dimensions scoring above 3. UX activities are carried out across development stages, though they remain partly ad hoc (P04) or inconsistently applied (P19). Limited understanding of UX remains a recurring issue within the organisation, particularly regarding roles (P04, P19) and UX ROI still undervalued (P19). Management supports UX (P19, P20), but this support

does not necessarily translate into sufficient staff or infrastructure (P19, P20). The lack of budget at this stage aligns with findings from [27], who noted that dedicated budget is not a key differentiator of perceived maturity. Time constraints are also reported as a barrier to more consistent and thorough UX activities (P20). Although these organisations often have enough staff, P04's calls for greater coordination and strategic oversight suggest the absence of a dedicated role to manage UX staff and activities.

5.3 Limitations and Strengths

The primary limitation of this study lies in the small sample size (N = 20), which constrains the stability of the psychometric analyses, particularly those related to internal consistency estimates and exploratory factor analysis. Consequently, the factor structures identified should be interpreted with caution and considered exploratory in nature, and further validation on a larger and more diverse sample is required. Additionally, the sample consisted almost exclusively of masters students enrolled in a work-study programme. While this does not undermine the objective of the study—namely, to examine whether the questionnaire functions as intended—it limits the extent to which the results reflect organisational UX maturity in professional settings. Moreover, many participants work in small organisations or act as the sole UX practitioner, which may restrict their ability to assess organisational-level practices, particularly for the organisational capability component, as they may only have partial visibility into strategic or decision-making processes.

Nevertheless, the results suggest that the questionnaire shows promise as a tool to explore UX maturity. As a first empirical application of the questionnaire, this data collection provides concrete evidence on item behaviour and internal structure, thereby informing priorities for refining the questionnaire. The convergence between internal consistency analyses and exploratory factor analysis, particularly for the execution of UX processes component, supports the coherence of this part of the instrument. Finally, the questionnaire offers clear practical value, as it can support comparative and longitudinal analyses and, when combined with qualitative data, help identify specific gaps in UX practices and inform organisational improvement efforts.

6 Conclusion and Future Work

This study presents a questionnaire for assessing UX maturity, focusing on execution of UX processes and UX organisational capabilities. The questionnaire provides both quantitative and qualitative insights into UX maturity. Qualitative responses reinforce participants scores and reflect maturity-level-specific challenges. While several issues recur across organisations, including limited user access, time pressure, and staffing shortages, distinct patterns emerge: no UX processes in level A, fragmented UX processes in level B, and inconsistent application of UX processes at level C. The convergence between score profiles and reported issues supports the questionnaire's relevance as a tool for assessing UX maturity in diverse organisational contexts.

The studys main limitations concern the scope of data collection and the developmental stage of the instrument. First, only one participant per organisation completed

the questionnaire, limiting the reliability of maturity assessments at the organisational level. Future work should include multiple participants per organisation to evaluate consistency in reported maturity. Second, the absence of observational data limits the ability to verify whether reported practices reflect reality, which constrains the validation of the instrument. Third, the questionnaire itself is incomplete, as key dimensions are missing. Finally, improving the psychometric quality of the UX maturity questionnaire and conducting workshops with UX experts would help item refinement and support stronger construct convergence through expert validation. Taken together, these limitations and future directions position this work as a first step towards a questionnaire-based approach for examining UX maturity across organisational contexts. With further validation, the instrument could support comparative and longitudinal analyses of UX maturity.

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