Research question:

What underlying design principles inform the development of professional competency frameworks across diverse professional contexts?

Thematic Analysis

Step 1: Familiarisation with the data

I've reviewed the description of development process field in the dataset consisting of 47 papers. This column details how each study developed professional competencies, often mentioning methods like literature reviews, Delphi processes, expert consultations, workshops, focus groups, and iterative refinement.

Step 2: Generating initial codes

Following are the initial codes from the dataset:

No.	Paper ID	Title	Stages of professional development	Codes
1.	3050	A competency framework on simulation modelling-supported decision-making for Master of Public Health graduates	1. Literature Review: 1518 records screened; 28 used for initial draft of 20 competencies 2. Delphi Round 1: Expert scoring (Likert scale); qualitative feedback incorporated 3. Delphi Round 2: Additional input and refinements 4. Consensus Workshop: Final refinement of wording, structure, implementation strategies 5. Final Framework: 20 competencies across 3 phases: stakeholder engagement, model building, and policy consensus	Literature review, Delphi process, workshop, expert validation
2.	2196	Developing a Competency Framework for Population Health Graduate Students Through Student and Faculty Collaboration	1. Environmental Scan: Review and synthesis of 26 competency frameworks; inductive thematic analysis to derive six core	Literature review, workshop, focus groups, final refinement

			competencies and four guiding principles 2. Community Resource Mapping: Identified 52 health organizations and 65 courses to align competencies with real-world offerings 3. Consultations: Focus groups with students and faculty to validate and refine framework 4. Final Framework Development: Consolidation of findings; email feedback from HPI members; finalized into a structured competency and guiding principles framework	
3.	2118	Developing a competency-based framework for resident-as-teacher	1) Focus group with residents 2) Drafting of framework (using ACGME & other standards) 3) Email survey for feedback 4) Roundtable meetings for revision 5) Two rounds of revision 6) Validation by 5 program directors 7) Pilot evaluation in 2 departments 8) English translation	Focus groups, workshop, validation, translation, dissemination, final refinement

			9) Presentation at international conference 10) Final revision	
4.	1768	In search for a public health leadership competency framework to support leadership curriculum-a consensus study	1. Literature review 2. Consensus development 3. Delphi survey	Literature review, workshop, Delphi process
5.	1642	Developing a competency model for maintenance 4.0 stakeholders	Phase 1: literature review Phase 2: interview Phase 3: development of the maintenance 4.0 competency model	Literature review, interview, workshop
6.	1627	The CompHP Core Competencies Framework for Health Promotion in Europe	Step 1: literature review Step 2: mapping and comparing frameworks Step 3: Delphi surveys Step 4: consensus-building approach	Literature review, workshop, Delphi process, final refinement
7.	1614	Competency development in business graduates: An industry-driven approach for examining the alignment of undergraduate business education with industry requirements	1. Exploratory Phase: Literature review and 39 semi-structured interviews (25 graduates, 14 employers); 2. Descriptive Phase: Survey design and implementation (900 responses total); 3. Critical/Analytical Phase: Data analysis, meta-level indicators, factor analysis.	Literature review, survey, data analysis
8.	1547	Construction of a competency evaluation model for Clinical Research Coordinators in China: a	1. Literature Review & Theoretical Frameworking:	Literature review, interview, Delphi

		study based on the Delphi method and questionnaire survey	Based on Onion Model Theory; identified five preliminary indicators 2. Semi-structured Interviews: 15 CRCs to elicit field challenges and competencies (Thematic Analysis) 3. Delphi Round 1: 16 experts rated 61 indicators; low-scoring items removed or revised 4. Delphi Round 2: Refined to 4 primary indicators, 20 secondary, 37 tertiary 5. Questionnaire Survey: 546 responses (491 valid); Likert-scale evaluation 6. Reliability and Validity Testing: Cronbach's α > 0.7; EFA and CFA confirmed structure fit 7. Weighting of Indicators: Used Analytic Hierarchy Process to assign weights to each tier of indicators	process, survey, statistical validity and reliability, software-assisted data analysis
9.	1542	Competency framework for specialist critical care nurses: A modified Delphi study	1. Literature Review: Identification of 89 competencies from 30 relevant studies and guidelines	Literature review, focus groups, framework drafting, Delphi process, expert validation, translation

			2. Focus Groups: Four sessions to supplement and validate initial framework (added 25 competencies) 3. Framework Drafting: Finalized initial framework with 101 competency items 4. Round 1 Delphi: 78 of 101 competencies reached consensus 5. Round 2 Delphi: 10 more competencies validated (total 88) 6. Round 3 Delphi: 4 final competencies agreed (total 92 included in final framework) 7. Validation: External review by 5 independent experts (face validity confirmation) 8. Translation: English version developed via forward-backward translation	
10.	1536	Developing a competency framework for training with simulations in healthcare: a qualitative study	1. Literature Review: 2 researchers independently searched PubMed, EMBASE, Cochrane, CINAHL, and Google Scholar (6 studies retained)	Literature review, competency drafting, Delphi process

			2. Consensus Panel: Nominal Group Technique during Transsimed meeting (clarification, discussion, voting); competencies rated and grouped into basic and advanced 3. Three-Round Delphi: • Round 1: Yes/No/With changes on each competency (revised based on <90% consensus) • Round 2: Likert rating (1–9); items <7 excluded or revised • Round 3: Final consensus on remaining items Result: 6 core competencies (basic level); 11 core competencies (advanced level)	
11.	1480	Development of a competency framework for advanced practice nurses: A co-design process	Round 1: Drafting based on literature and existing APN practices. Round 2: Group discussions, interviews, and written feedback from stakeholders to revise framework.	Framework drafting, focus groups, interview, expert validation
12.	1445	A Competency Framework for Health Research Ethics Educational Programs: Results from a Stakeholder-Driven Mixed-Method Process	1. Planning: Team formation, definition of scope (HRE for human and nonhuman research)	Preparation, framework drafting, literature review, data analysis,

			2. Context Mapping: Creation of HRE system model (13 informants) 3. Data Gathering: Literature review, concept mapping (brainstorming, synthesis, sorting, cluster analysis) 4. Framework Translation: Creation of 7-domain framework (FRESCO) with 27 subdomains 5. Reporting: Structured using CONFERD-HP guidelines 6. Evaluation: International survey on clarity, relevance, and priority for each domain/subdomain	translation, final refinement
13.	1390	Core Competencies for Pediatric Consultation-Liaison Psychiatry in Child and Adolescent Psychiatry Fellowship Training	1) Formation of expert workgroup at AACAP 2017 meeting 2) Identification of goals and candidate competencies 3) Review and modification of competencies based on existing adult CLP and ACGME standards 4) Survey distribution to a national listserv 5) Analysis of consensus data and finalization of	Expert grouping, competency drafting, workshop, survey, data analysis, final refinement

			pediatric-specific CLP competencies	
14.	1378	Entry-to-practice public health nursing competencies: A Delphi method and knowledge translation strategy	Phase 1: Environmental scan (literature review, review of existing frameworks) Phase 2: Drafting of competency statements (aligned with CHNC and PHAC standards) Phase 3: Modified Delphi process (face-to-face forum, online survey, consensus, and finalization)	Literature review, competency drafting, Delphi process
15.	1361	Developing Core Competencies for Pharmacy Graduates: The Lebanese Experience	1) Primer Development: Mapped global standards (FIP/WHO, ACPE, CAPE, NAPRA) 2) Draft Framework: Domains, competencies, and measurable behaviors prepared 3) External Expert Review: 10 senior experts gave input and revisions 4) Academic Board Review: Multiple revisions, mapping to local curriculum, feedback from faculties 5) Delphi Rounds (3): Consensus and cultural adaptation	Preparation, competency drafting, expert validation, Delphi process, final refinement

			6) Finalization and Approval: Framework formally adopted by the Lebanese Order of Pharmacists (OPL)	
16.	1302	A nationally agreed cross-professional competency framework to facilitate genomic testing	1) Literature and framework review 2) Draft framework development 3) Consensus meeting using nominal group technique with 25 experts 4) Mapping exercise and voting rounds (≥70% agreement) 5) Open consultation with clinicians and patients 6) Finalization and publication of 8 competency statements 7) National survey evaluation (239 responses) and Google Analytics tracking	Literature review, framework drafting, focus groups, expert validation, final refinement, survey
17.	1222	Competency-Based Education: Developing an Advanced Competency Framework for Indonesian Pharmacists	1. Translation Phase: Forward-backward translation of ACLF framework into Bahasa; reconciliation and validation 2. Adoption & Adaptation Phase: Mapping IADF to national standard (SKAI); 5 consensus panels	Translation, competency drafting, expert validation, final refinement

			3. Expert Panel Review: 39 experts reviewed and refined IADF 4. Validation Phase: National online self-assessment survey (N = 6,212); MCA used to test discriminant validity 5. Finalization Phase: Policy integration and refinement through IAI leadership and SIGs	
18.	1052	Development of an interprofessional competency framework for collaborative practice in Japan	Stage 1: Initial categorization of potential competency domains Stage 2: Guiding principles formulated Stage 3: Feedback on the prototype Stage 4: Final consensus	Competency drafting, expert validation, final refinement
19.	951	Bachelor nursing competencies to care for children in hospital and home settings: A Delphi study	Round 1: List of pediatric nursing competencies and indicators at the bachelor's level generation Panel of experts (N=8) Consensus Round 2: Importance for each competence assessment Survey with experts (N=129) Consensus on all competences	Competency drafting, survey, final refinement,

			Round 3: Importance for each competence confirmation Survey with experts (N=132) Outcome: Consensus on the 7 domains 23 Competencies	
20.	918	Development of a professional competency framework for Australian sonographers-perspectives for developing competencies using a Delphi methodology	Round 1: Eligible sonographers were sent information prior to the study and returned written consent prior to commencing Round 2: Recruitment aimed to obtain a pool of sonographers from diverse geographic locations and clinical settings with diverse expertise across all sonographic procedures. Round 3: the Delphi process commenced.	Preparation, expert group forming, Delphi process
21.	916	Developing a professional-practice-model-based nursing organizational informatics competency model	(1) a research working team was formed from our hospital was formed; (2) a prototype model was first developed through group discussion by a multidisciplinary expert	Expert group forming, framework drafting, Delphi process

			consultant team within our hospital, who are familiar with our hospital culture and requirements; and (3) a final model was developed and validated according to the results of the Delphi approach applied to invited outpatient nursing informatics experts, who are experienced in domain knowledge and cross-hospital contexts. and see figure 1.	
22.	892	Competencies for Transformational Leadership in Public Health-An International Delphi Consensus Study	1. Literature review 2. Online survey I 3. Online survey II 4. Workshop I 5. Online survey III 6. Workshop II	Literature review, survey, workshop
23.	871	Development and validation of a competency framework for veterinarians	Phase 1: The panel members were invited to judge the relevance Phase 2: Wording of the competencies of the framework Phase 3: The panel members received written feedback comprising the means and standard deviations of the relevance scores and a	Expert validation, framework drafting, final refinement

			summary of the textual comments Phase 4: Finally, panel members were asked to categorize the competencies into domains.	
24.	839	An International Competency Framework for High-Quality Workforce Development in Integrated Care (IC): A Modified Delphi Study Among Global Participants	STAGE 1: Systematic identification of the problem area STAGE 2: Selection of the panel members STAGE 3: Delphi study rounds STAGE 4: Consensus criteria, closing criteria and group stability and see figure 1.	Literature review, expert group forming, Delphi process, final refinement
25.	800	A multi-perspective approach to developing the Saudi Health Informatics Competency Framework	1) Scoping review; 2) Online survey; 3) Focus groups; 4) Expert panel meetings	Literature review, survey, focus groups, expert validation
26.	789	Competency development for pharmacy: adopting and adapting the FIP global advanced development framework	Phase 1: translation Phase 2: initial validation Phase 3: final validation Phase 4: national workforce assessment - national survey	Translation, expert validation, survey
27.	788	Competency development for pharmacy: Adopting and adapting the Global Competency Framework	Phase one: translation of the FIP GbCF into Arabic to ensure proper utilisation of the developed framework by pharmacists in Kuwait	Translation, expert group forming, framework drafting

			as the official language in the country is Arabic. Phase two: forming a face-two-face consensus panels. Phase three: the assessment of the relevance of the FIP GbCF behavioural statements across a wider population of pharmacists in Kuwait across all settings to develop the KFCF and framework development. and see figure 1.	
28	664	National Standards in Pathology Education: Developing Competencies for Integrated Medical School Curricula	1) Context Setting: Identification of need for national pathology competencies due to shift in integrated curricula 2) Proposal of 3 Core Competency Domains: • Disease Mechanisms/Processes • Organ System Pathology • Diagnostic Medicine 3) Drafting of learning objectives aligned with each domain and linked to ACGME, LCME, and educational standards	- Literature review - Expert panel - Framework/model design

			4) Ongoing Curation: Creation of a living document managed by national pathologists (via APC UME Committee) 5) Integration Plan: Framework designed to allow independent school customization while maintaining national standardization of learning outcomes	
29	661	Competency domains for registered nurse preceptor professional development: Evidence from a modified e-Delphi study	1) Literature review; 2) Expert preparatory group; 3) e-Delphi Round 1 and Round 2	- Literature review - Expert panel - Framework/model design
30	644	Developing a competency profile for newly graduated registered nurses in South Africa	1) Semi-structured interviews using a predefined guide based on KSAs (Knowledge, Skills, Attitudes) 2) Thematic analysis using Braun & Clarke's six-step method 3) Separate coding of transcripts from both participant groups 4) Collaboration with a co-coder for validation 5) Synthesis of common and unique themes and sub-themes from both groups	- Interview - Thematic analysis - Validation step - Framework / model design

			6) Development of a structured competency profile for NGRNs	
31	627	Core competencies for emergency medicine clerkships: results of a Canadian consensus initiative	1) Initial Competency Drafting: Review of 9 EM clerkship curricula and literature 2) Round 1 Delphi: 152 competencies rated using 7-point Likert scale 3) Analysis and Refinement: Items categorized by agreement levels 4) Round 2 Delphi: Re-rated as "must include" or "not include"; consensus set at ≥75% 5) Final List: Reduced to 62 competencies 6) External Review: National EM and medical education experts validated methodology and results	- Literature review - Delphi study - Expert panel - Delphi study - Iterative refinement - Framework / model design
32	600	Development and Refinement of a Matrix Competency Framework, with Associated Entrustable Professional Activities, to Support Initial Pharmacy Education in Kuwait	1. Guiding Principles: Developed by curriculum reform team 2. Needs Assessment: Conducted via 8 stakeholder-specific focus groups to identify population needs, EPAs, competencies, and barriers	- Preparation - Focus groups - Framework / model design - Iterative refinement

			3. Initial Competency Framework: Derived from focus group data + existing frameworks (NAPRA, FIP, CAPE, PSI), structured into 3 professional × 8 transversal domains (matrix) 4. EPA Profiling: 17 EPAs initially created with enabling competencies mapped 5. Refinement Phase (2019): Redundant EPAs merged (down to 12); 77 enabling competencies reduced to 66; global behavior profile added for longitudinal assessment	
33	584	The development and validation of a global advanced development framework for the pharmacy workforce: a four-stage multi-methods approach	Stage I: Assessment of initial content and cultural validation of the UK ALF Stage II: Transnational modified Delphi (qualitative feedback via online survey, 21 experts) Stage III: Global pharmacy leadership engagement (29 experts) Stage IV: Implementation case studies at individual, institutional, and national levels across 5 countries	- Literature review - Survey - Feedback - Expert panel - Case study collation - Thematic analysis - Framework / model design

34	568	Development of a European competency framework for health and other professionals to support behaviour change in persons self-managing chronic disease	Part 1 – Delphi Study: 1) Review of 7 existing frameworks 2) Drafting 47 initial competencies 3) Refinement to 27 statements 4) Round 1 Delphi (48 participants, consensus for all items) 5) 2 items removed, 1 added, 14 revised 6) Round 2 Delphi (40 participants, consensus on 15 items) 7) Final framework with 26 competency statements Part 2 – BCT Mapping: 8) Literature review of systematic reviews using BCT Taxonomy v1 9) Identification of 29 effective BCTs 10) Expert panel review for generalizability and additional BCT suggestions 11) Finalization of 21 core and supplementary BCTs linked to competencies	- Literature review - Preparatory work - Iterative refinement - Delphi study - Framework / model design - Expert feedback - Framework / model design
35	535	A competency model for project construction team and project control team	Round 1: Literature review & interviews;	- Literature review - Interview

			Round 2: Questionnaire; Round 3: Model construction; Round 4: Validation via performance correlation	- Survey - Framework / model design - Finalization
36	506	Development of a national medical leadership competency framework: the Dutch approach	1. Literature review 2. Stakeholder interviews 3. Focus groups 4. Surveys 5. International comparison 6. Data synthesis 7. Framework drafting 8. Finalization and translation	- Literature review - Interview - Focus groups - Survey - Validation step - Framework / model design - Translation - Finalization
37	486	Conceptual Key Competency Model for Smart Factories in Productioan Processes	1. Literature Review: Defined need for new competencies in smart factories and Industry 4.0 context 2. Sampling: Purposive sampling of experts across industry, education, and government sectors 3. Data Collection: Semi-structured interviews (~45 mins each), audio recorded and transcribed 4. Data Analysis: Content analysis with independent coding by two researchers; disputes resolved by third coder	- Literature review - Interview - Content analysis - Framework / model design

			5. Model Development: Constructed key competency model with two categories: operational knowledge (technical, ICT, innovation/creativity) and personal characteristics (soft skills, openness to learning, flexibility)	
38	457	Developing a reliable and valid competency model for assistant dentists in China	1. Competency Characteristic System Development: Literature review + 5 focus groups across expert types; derived 8 domains and 58 second-level competencies 2. Delphi Panel (3 rounds): Expert scoring and feedback; reduced to 7 first-level and 50 second-level competencies 3. Questionnaire Survey: Likert-scale importance ratings by 1389 assistant dentists; randomization to avoid order bias 4. EFA & CFA: Exploratory and confirmatory factor analysis confirmed 7-domain, 47-item competency model with strong reliability and validity	- Literature review - Framework / model design - Focus group - Delphi study - Survey - Validation step
39	424	Developing a competency model for Chinese general practitioners: a mixed-methods study	Phase I: building the GP's competency dictionary	- Literature review

			Phase II: establishing the competency model Phase III: validating the competency model	- Framework / model design - Validation step
40	367	An Employee Competency Framework in a Welfare Organization	1. Book and article review 2. Initial survey design 3. Validity evaluation of the obtained components 4. Preparation of the final questionnaire 5. Extraction of weights related to each competency using pairwise comparison matrix and AHP approach 6. Analysis 7. Final framework presentation	- Literature review - Survey - Preparatory work - MCDM analysis - Framework / model design - Finalization
41	316	Competency Framework for Podiatric Medicine Training in Canada: An Adapted Delphi Study	1. Identification of the competencies expected of graduates of the profession; 2. Identification of the competencies and their components; 3. Definition of the steps in the competency development process; 4. Choice of methods, experiences and pedagogical tools; 5. Designing of evaluation methods to measure progress	- Literature review - Framework / model design - Validation step - Evaluation process

			of competency development; and 6. Elaboration of the evaluation of program outcomes.	
42	315	Development of the Competency Framework for Southeast Asian School Heads (2014 Edition): A Journey into Excellent School Leadership: *Keyword Branch*	Phase 1: Focus Group Discussion Process using the Appreciative Inquiry Approach with school heads and school stakeholders Phase 2: Regional workshop process 1 and 2	- Focus group - Workshop - Framework / model design
43	300	Development of a national pain management competency profile to guide entry-level physiotherapy education in Canada	Step 1: generation of the preliminary competency profile Step 2: external review of the preliminary competency profile Step 3: stakeholder survey to achieve consensus Step 4: survey analysis and response to participants Step 5: evaluation of process	- Literature review - Framework / model design - Validation step - Survey - Analysis - Evaluation process
44	239	Development of a Professional Competency Framework for UK Food Science Graduates	1. Initial Role Definition: Draft 14 graduate role profiles developed via stakeholder meeting + desktop review 2. Survey Design & Piloting: Built around 48 pre-defined	- Literature review - Stakeholder consensus - Survey - Analysis - Framework / model design - Validation step

			competency elements (from Weston et al., 2017) 3. Nationwide Survey: Desirability rated via Likert scale across 14 roles 4. Descriptive Data Analysis: Stacked bar charts, median comparisons, frequency ranking 5. Principal Component Analysis (PCA): Eight-theme solution finalized through factor rotation 6. Stakeholder Validation: Ratified CFGC framework in stakeholder roundtable 7. Dissemination: Role-based profiles, infographics, and open-access toolkit shared via IFST and Nottingham websites	- Finalization
45	92	EntreCompEdu, a Professional Development Framework for Entrepreneurial Education	1. Literature Review & Policy Mapping: Short review of 27 sources on entrepreneurial pedagogy and teacher PD 2. Framework Design: Based on EntreComp; identified 5 competence areas and 17 educator competencies 3. Co-Design & Advisory Feedback: Contributions from EU policymakers, teachers,	- Literature review - Framework / model design - Expert feedback - Implementation - Iterative refinement - Evaluation process

			education consultants, academics 4. Pilot Implementation: 308 teachers across 5 countries tested EntreCompEdu modules 5. Evaluation & Iteration: Refinement based on feedback; embedded tools include LoopMe, MTEE (self-evaluation), professional development modules, logic models	
46	61	Development of a Competency Framework for Quality Improvement in Family Medicine: A Qualitative Study	1. Literature review 2. Consensus development panels 3. Delphi survey	- Literature review - Framework / model design - Delphi study
47	48	Competency-Based Framework and Continuing Education for Preparing a Skilled School Health Workforce for Asthma Care: The Colorado Experience	Step 1: scoping review Step 2: round 1 Delphi procedure Step 3: round 2 Delphi procedure Step 4: consensus	- Literature review - Delphi study - Framework / model design

Here is the list of the codes acquired from the dataset:

Design Code	Frequency
Literature review	32
Delphi process	19
Survey	15
Final refinement	11
Focus groups	10
Interview	7
Framework / model design	19
Expert validation	18
Workshop	9
Translation	6
Competency drafting	6
Data analysis	6
Preparation	6
Expert group forming	5

Design Code	Frequency
Evaluation	5
Implementation	4
Feedback	4
Iterative refinement	4

Step 3: Searching for themes

Codes were grouped into broader **conceptual themes** to reflect the logic and flow of professional competency development processes:

Theme 1: Foundational Inquiry and Evidence Gathering

- **Includes:** Literature review, survey, interview, focus groups, data analysis
- **Rationale:** This stage focuses on understanding the context, synthesizing prior research, and collecting empirical evidence.

Theme 2: Consensus-Building and Collaborative Validation

- **Includes:** Delphi process, expert validation, expert group forming, workshop, feedback
- **Rationale:** Involves engaging stakeholders and experts to validate, revise, and agree on the proposed competencies.

Theme 3: Framework Development and Iterative Refinement

- **Includes:** Competency drafting, framework/model design, final refinement, translation, iterative refinement, preparation, implementation, evaluation
- **Rationale:** These methods focus on creating, refining, validating, and operationalizing competency models for practical use

Step 4: Revising the themes

Upon reviewing all 47 cases:

- All studies used at least one method from each theme.
- The themes represent **chronological stages** of development but also reflect **functional categories** of competency design work.
- Themes are non-exclusive; most studies used 5–7 methods, indicating a layered, mixed-method approach to design.

Step 5: Defining and naming themes

Theme	Description	Key Activities
Foundational Inquiry and Evidence Gathering	Methods used to understand context, needs, and existing knowledge.	Literature review, interviews, surveys, focus groups, data analysis
Consensus-Building and Collaborative Validation	Processes that involve experts and stakeholders to ensure accuracy and legitimacy.	Delphi process, workshops, expert validation, feedback
Framework Development and Iterative Refinement	Actions aimed at drafting, refining, translating, and implementing the competency frameworks.	Competency drafting, final refinement, translation, evaluation, implementation

Step 6: Producing the report

This thematic analysis reveals a robust, cyclical, and evidence-based process behind the development of competency frameworks across professions. Key insights include:

- **All frameworks are grounded in prior research** via literature reviews and stakeholder input.
- **Delphi methods and expert panels** remain central to achieving consensus.
- **Frameworks are never static**: they undergo iterative refinement and are translated, validated, and tailored for implementation in different contexts.
- **Design principles are interdisciplinary**, suggesting a converging methodological approach across healthcare, education, and professional training sectors.