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DEVELOPING AN IT WORKFORCE PLANNING WITH CROWDWORKING MODEL FOR INDONESIAN BANKING

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ABSTRACT

This study proposes an IT workforce planning with crowdworking model for Indonesian banking industry, addressing challenges on IT workforce planning process and rising trend of crowdworking. Using a Design Science Research Method, we developed a model based on literature review, interviews and FGD with expert practitioners in Indonesian banking industry and has been evaluated through user acceptance test and expert judgment. The proposed model incorporates six key features: analyse current workforce, future workforce estimation, gap analysis, action identification, and process evaluation, in addition we are also adding internal crowdworking components as one of strategy to improve IT workforce productivity. A use case diagram, class diagram, and prototype were developed to demonstrate the model's practical application. Findings suggest that the model can improve IT workforce planning process, particularly in aligning HR with business objectives and facilitating crowdworking process. This study contributes to both theory and practice by providing a structured approach to IT workforce planning with crowdworking in Indonesian banking industry.
Keywords: *Crowdworking, Internal Crowdworking, IT Workforce Planning, Workforce Planning*

1. INTRODUCTION

Digital Banking growth in Indonesia currently on an upward trend which followed by declining number of branches that owned by the bank [1]. According to the Indonesian Bankers Association, banking is an industry that requires digital transformation, even though it currently faces challenges from limited digital talent situation [2]. Significant growth of fintech company in Indonesia also creating a challenge for banks, including the human capital aspects [3].These situation will also impacting how company carries out their human resource management including their workforce planning process. [4].

IT workforce planning especially on to solve the skill gap is considered as one of the top company priorities [5]. OJK as Indonesian financial service authority also mandated banks to have a proper workforce planning to ensure IT workforce adequacy and competency [6], however based on our findings, in some organization IT Workforce planning is still conducted manually, hence the company have difficulties in quantitatively measure IT workforce usage on a regular basis [7]. In the previous research of evaluation IT Human Resources in bank especially that owned digital banking product in Indonesia, area of improvement to improve their human resources management process is on how to plan and track IT and business manpower usage. One of the action to improve manpower planning and tracking process is through system implementation to support these process, so it they can ensure IT workforce adequacy [7].

Apart from that, one of the rising trends regarding to workforce strategy is the use of crowdworking, since it is describes can become a promising alternative to traditional employment in digital era, it is also has an impact to the company's HR planning process, hence, crowdworking also considered to be an alternative strategy for human resource management, including the human resource planning process [8]. Relate to the company's encouragement to carry out workforce planning management assisted by crowdworking, it was stated that there are several jobs in the software development process that can be supported by crowdworking, including the development process [9]. Expected benefit from crowdworking implementation includes, increase ability to retain qualified employees while reducing staff costs, and ability to improve ability to predict employee qualifications requirement, and potentially can

increase employee flexibility [8]. Internal crowdworking are can be consider as one of the solution to solve the shortage of skilled employees in some areas, and also can be used to motivate and retain employees, like internal labour markets, that can be a helpful tool and it is also mention that internal crowdworwking can offers so many potential for strategic HRM in organisations [8].

However, in previous research conducted by Schulte, Schlicher and Maier, current research related to crowdworking is still unstructured, segmented and lacks clarity between the definitions of gig economy, crowdsourcing, and crowdworking [10]. This is even more important because in its implementation it is stated that companies must choose the crowdsourcing model that best suits their business needs [11]. Meanwhile, from the risk perspective, there are several things that companies need to pay attention to, which includes definition of crowdworking tasks and/or projects, difficulties in identifying crowdworking cost, risk of losing control over crowd activities, risk in the process of creating an appropriate incentive structure, internal knowledge leaking risk, and risk of rejection from internal staff [9]. Planning, management and control in crowdworking process is mentioned as one of the key of crowdworking efficiency [8].

In the previous research on internal crowdworking, it was explained that focus group discussions with related parties, HR, and employees including platform experts will be useful in obtaining more detailed assessments related to internal crowdworking itself [8]. Based on the explanation above, we consider it necessary to conduct research to build a Crowdworking system model to assist the workforce planning process.

2. LITERATURE REVIEW

2.1 IT Workforce Planning

Workforce planning is an effort to create strategic alignment between human resources and business objectives, this is includes methodological process for analyzing current workforce conditions, estimating future workforce, identifying identified gaps, and implementing existing solutions [12]. Workforce planning is a key component of Human Resources strategy, not only aims to align human resources with the company's business plan to meet the company's goals, workforce planning also aims to ensure that the organization has and can always obtain a workforce that matches the skills and work performed in a timely manner to be able to carry out tasks effectively and efficiently[13], and it can significantly contribute to the company's ROI [14]. Based on the CIPD explanation, Workforce Planning is the process of analyzing the current workforce, determining future workforce requirement, identifying gaps between the current workforce and future needs, and implementing solutions to meet these needs to support the company's strategic plan [15]. It is also important for IT leaders to work closely with human resources to develop talent strategies to meet the current and future business requirements [16].

Workforce planning is one of the biggest challenges in a company in terms of determining the number of employees to be hired, dismissed, and assigned to certain jobs, where the bigger the company, the more difficult this problem becomes to solve [17]. In line with the evolution of the workforce and demographic changes, workforce planning is also one of the biggest challenge that faced by organization, which can resulting in risk of disalignment between employee skills and skills that required by the organization [18] [19].

In relation to digital transformation in an organization, it is said that digital transformation also has an impact on human resources planning where the relationship can be mediated through innovation [20]. In the explanation given by Oliver Wyman and Mercer regarding workforce in digital transformation, there is a new model for workforce strategy development where the process has several keys including [21]:

1. Integrated processes, directly linked to business strategy
2. Continuous and multi-dimensional training
3. HR and workforce help define problems, define solutions and perform workforce adjustments
4. Develop interconnected workforce strategies

Similar statement was also explained by EY, where it was explained that in relation to the changes that are currently occurring, the workforce planning process is important to be carried out in a fluid and agile manner to continuously obtain input from the business to increase the organization effectiveness, which starting from business strategy and requiring data to support this process. [22].

According to research conducted by CEB Gartner, 4 out of 5 IT positions need adjustment to be able to handle changes in the capability requirements expected from IT personnel, for this there are 2 important steps that can be taken by IT leaders [23] Proactively anticipating changes in IT roles and skills, because 61% of organizations do not yet have a forecast of the IT skills needed, and Making a strategic plan for the IT workforce, it is

stated that only around 39% of IT organizations carry out IT workforce planning.

Organizations that progressively develop IT Workforce planning, can perform following steps [23]:

1. Alignment between company objectives with IT objectives
2. Identifying obstacles to desired conditions
3. Defining future conditions
4. Summarizing the profiles and competencies required for critical roles

According to Deloitte, there are several key areas to support strategic workforce planning, including workforce demand planning, resource and skill management, and employee planning. [24].

Based on some of the explanations given above, workforce planning is a systematic step taken by a company to align human resources with the company's business plan by analyzing the current workforce, determining future workforce needs, identifying gaps between the current workforce and future needs, and implementing solutions to meet those needs which are carried out in an integrated and sustainable manner. Where it is stated that one way to improve the workforce planning process in an organization is through the implementation of a system to support the workforce planning process [7].

To understand what are the features of workforce planning, available guidelines that describing process of workforce planning will be extracted in this study which includes Chartered Institute of Personnel and Development (CIPD) [25], US OPM Workforce Planning Model (OPM) [26], International Personnel Management Association Workforce Planning Guide (IPMA) [12], IBM Workforce Planning Model [27], and OECD Common Feature of Workforce Planning [28]. Workforce planning process components that have been summarized are presented in table 1 (Appendix A).

From the feature or process or IT workforce planning that has been identified, comparison has been made with the model that previously explained by Andrew Mayo, which also showing a similar features with workforce planning process which has been mapped. Workforce planning features or process explained in the studies are includes [29]:

1. Analyzing manpower requirements to get estimation of different job requirements for specific roles which includes its required skills.
2. Performing gap analysis, which can be done by comparing the organization's future requirements with the available resources in the organization.
3. Analize internal resources within an organization, that can be obtained through internal employee movement, developing employees or hiring from external resources.
4. Formulize strategy to close the manpower gap.

Based on the process components that has been mapped on the table 1, and compared it with Andrew Mayo's model, the major workforce planning process that can be identified are includes analyse future and current workforce within the organization, gap identification implement action and perform continuous evaluation.

While these studies provide a valuable insights of workforce planning process, they didn't provide a specific recommendations or guidelines on how to integrate IT workforce planning with broader organizational workforce planning process.

2.2 Internal Crowdworking

Crowdworking sometimes reffered to as crowdsourcing [30] or gig economy [10] is a process of finding work solutions to a group of contributors using the web or through social collaboration, usually using mechanisms to attract interested participants [31]. in a more comprehensive study, it is explained that the definition and characteristics of crowdworking are temporary and flexible working relationships to complete a job mediated by a platform [10]. Meanwhile, the crowdsourcing information system is a socio-technical system that provides services to obtain great potential from large groups of people through the web [32]. crowdsourcing is said to be able to help companies to utilize previously categorized as an unreachable resources. [33].

The benefits offered by crowdsourcing include access to talent, speed, and lower costs. [34]. Some of the benefits that can be provided by crowdsourcing include access to flexible human resources and skills, being able to integrate stakeholders [35], cost savings, access to large HR pool [30], It is even said to be able to increase engagement [34] and retention of internal talent [36], and help internal talent in gaining new skills [34]. However, in its implementation, it is stated that companies must choose the crowdsourcing model that best suits their business needs. [11].

Meanwhile, from the risk perspective, there are several things that need to be considered by the Company in relation to the implementation of crowdworking [9] namely the need to describe the definition of tasks and/or projects precisely, the difficulty in calculating (total) costs, and the risk of losing control over crowd activities, the risk in the

process of creating an appropriate incentive structure, the risk of internal knowledge being lost, and the risk of rejection from internal staff.

Crowdsourcing is grouped into external and internal crowdsourcing. In external crowdsourcing, the crowd is formed from individuals outside the company, while internal crowdsourcing extends the problem-solving process to contributors outside formal boundaries, for example, division boundaries, geographic locations, hierarchical structures, to mobilize and strengthen knowledge exchange and interaction within the company [37], and in other studies it is described as an IT enabled group where its activities are based on open calls within the company [38]. Some of the work in progress in software development that can use crowdwork include the process [9] requirement analysis, design, coding, testing, documentation, operations and maintenance.

This internal crowdsourcing concept will allow employees in the organization to have the opportunity to increase their contributions to the company [37], and can increase flexibility in the workforce fulfilment process [39]. To implement internal crowdsourcing, companies need to have a way and measurement to open opportunities for career development internally. In addition, the internal crowdsourcing process will also use an internal crowdsourcing platform. [37]. Internal crowdworking states that the steps taken are as follows: breaking down work into individual tasks, offering them to employees and assigning the tasks to the most appropriate party [8].

Previous studies on internal crowdworking have explored potential benefits, challenges and its general process, unfortunately did not address issue of integrating crowdworking with overall workforce planning processes. Specifically, these studies have not provided specific guidance on how to incorporate crowdworking into existing workforce planning. Furthermore, previous research did not gather further insights through Focus Group Discussions (FGD) or expert judgment and there are no previous studies specifically within IT functions in the banking industry, which has unique workforce planning challenges.

3. RESEARCH METHODOLOGY

Research question for this study is "What is IT workforce planning with crowdworking model for Indonesian banking industry?"

This research will adopt design science research methodology, which is said to be used as a guide for research that designs information systems [40]. In the DSRM there are several processes that need to be perform, which explained in figure 1:

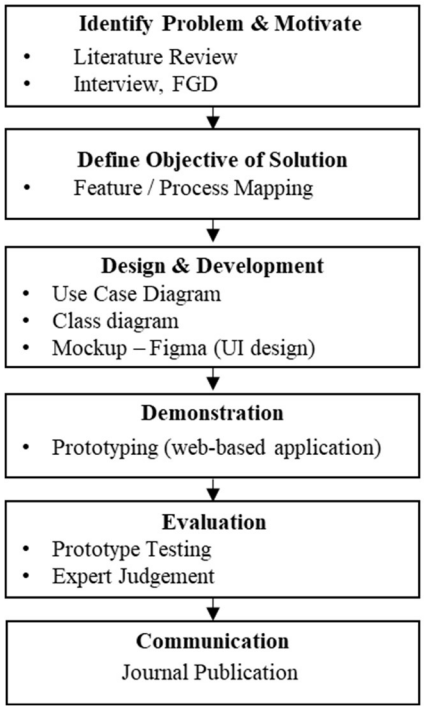


Figure 1: Research methodology adopting design science research iteration

1. The problem formulation process will be carried out through a literature study related to the workforce planning and crowdworking, including common features or process of workforce planning and crowdworking process and will be discussed through interview and focus group discussion. Interviews and FGDs will be conducted with banking experts, especially IT and Human resources, who are involved in the IT workforce planning process. The experts who will be interviewed and participate in the FGD have managerial up to SVP level. The output of this process is to get IT workforce planning with crowdworking components which will be designed and developed further.
2. The results of this problem formulation process will be used in the objective solution process to justify the problems that can be solved through this research. IT workforce planning components that have been identified will be mapped as an IT workforce planning component.
3. Model design & development, the design will be done by creating a use case diagram and class diagram that will be used to support

prototyping process. Output of this process will be used as a system requirement for the prototyping process.
4. After the design and model development process are completed, demonstration process will be carried out to produce a prototype web-based application, in this study will use PHP programming language and SQL database.
5. The evaluation process will be carried out through the user acceptance test process using black box testing, ISO / IEC 25010 measurement and expert judgement will also use to in addition to prototype testing, to have understanding on the model implementation potential in Indonesia Banking industry. This evaluation process will also answer the research questions of this study.
6. Design science research will be closed by communication process, by publishing results of this study to an international journal.

4. DESIGN & DEVELOPMENT

To design model of alignment between workforce planning with crowdworking model, initial requirement gathering will be done by analyzing features from both workforce planning and crowdworking process, identified feature will be formulized into a proposed model which will be designed, developed and discussed on interview and focus group discussion.

4.1 Workforce Planning Features

For workforce planning model, we will used model that previously described by Andrew Mayo, based his previous research, workforce planning steps are includes [29]:

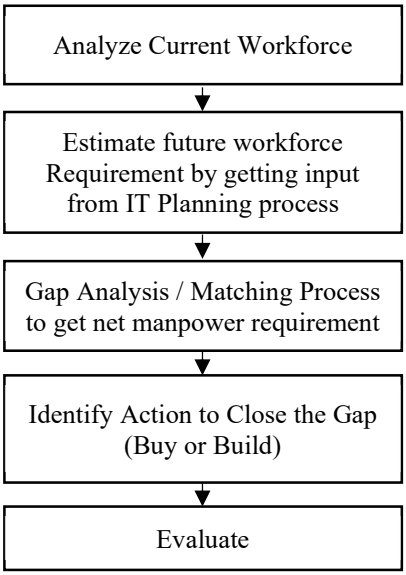
1. Analise internal resources in the organization, that can be obtained through internal employee movement, developing employees or hiring from external resources.
2. Analyzing manpower requirements to get estimation of different job requirements for specific roles which includes its required skills.
3. Performing gap analysis, which can be done by comparing the organization's future requirements with the available resources in the organization.
4. Determine a strategy to close the gap.

To have alignment with IT strategy, the workforce planning process will be started by obtaining input from the IT planning process by using the IT roadmap or blueprint [41]. IT roadmap or IT blueprint can be extracted to identify what is the future project in the organization which will be use as baseline to get IT workforce planning data. by analyzing workforce requirements organization can have an estimation of future manpower requirement. The IT workforce planning process that will be used as a baseline to design the model will be explained in figure 2.

Figure 2: Workforce planning process feature

The proposed workforce planning process model in this study are:

1. Analyze current IT workforce in the organization [25] [26] [12] [27].
2. Align with company strategic direction by, obtaining a list of the identified project as input from the IT planning process [42] [26] [27] [28], the information will be used to estimate future workforce requirement [25] [26] [12]. By performing this process organization will get data that will be a baseline to identify future manpower requirement in the organization.
3. Performing IT resource allocation to IT project that has been identified in the earlier process,



that also considering competency factor [43], workload, and recruitment cost [44]. If the organization still have unfulfilled manpower requirement on IT project, organization will need to identify action to close the gap.
4. Identify action to close the gap [25] [26] [27] [28], to close the gap 3 options can be analyzed [45]:
   a. Build: Develop internal talent within an organization through training or project assignment
   b. Buy: Recruit external resources if there is no available internal talents or employees to fill the manpower requirement gap.

c. Borrow: Obtain talent from external organizations, for example, vendor or consultant
d. Other strategies or action that can be taken to reduce the gap.

5. Evaluate the process [25] [26] [27] [28]

4.2 Internal Crowdworking Features

In crowdworking, the general processs started by crowdsourcer or owner of IT project to break the task based on identified IT projects and offers that task to potential crowdworkers or candidates through crowdworking features [35]. Collaboration process among crowdsourcers whose create the task and crowdworkers is carried out via an crowdworking platform. However for internal crowdworking model, the population of potential crowdworkers or candidates are limited to internal employees.

In previous research conducted on internal Crowdworking it was stated that the steps taken are as follows: breaking down work into individual tasks, offering them to employees and assigning tasks to the most appropriate party [8].

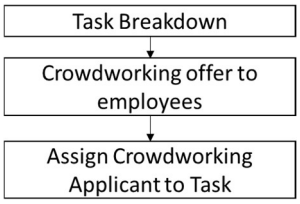


Figure 3: Internal Crowdworking Process feature

Internal crowdworking features in this model includes:

1. Task breakdown [8] [9] [37] by using identified IT project manpower requirements.
2. Offer crowdworking opportunities to employees or crowd workers candidates via crowdworking platforms [8] [9] [37].
3. Assign crowdworking applicants to the available task [8] [9] [37]. Process to identify which is the best candidate to be assigned into the task can be support by skill matching features by comparing skill that requires to run the task and employees specific skill level [8].

4.3 Aligning IT Workforce Planning with Crowdworking

After identifying features or process from both IT workforce planning and Crowdworking, the features are mapped and combined to createa alignment among these processes.

Based on feature mapping that was found, below are the process features of manpower planning with crowdworking are:

1. The process will be started by performing analyzing current workforce which either be done through managing employee data and any required attribute, for example, position, grade, and their skill or competencies in existing HRIS or in a separate system.
2. Align with company IT strategic planning by getting a list of the identified project as input from the IT planning process [42][26][27][28] and to estimate future workforce requirement [25][26][12] which can be done through create a breakdown of manpower requirement for each project which will be used as references in resources allocation and input for crowdworking process.
3. Performing resource allocation to IT project, that also considering competency factor [43], workload, and recruitment cost [44] which need to be adjusted to meet requirements. If there is no available project team to be assigned, owner of the project can consider to do crowdworking posting, that will be available for other employees [25] [26] [12] [27] [28].
4. The process will be continued by a crowdworking process which will be initiated by getting available task from previous steps and offer it through crowdworking platform, employees then able to apply to become a crowdworking candidate and be selected by owner of the project to be assigned and responsible for that task. In previous research, it was explained that there is a need for adequate job-skill matching features, so it is important to conduct further research [46].
5. After the crowdworking process, organization can identify which manpower still cannot be fulfilled by current employees including crowdworking candidates, hence need to identify what solution is suitable to close the gap whether by build or training existing employees so they can have necessary skills or through by or hiring from external.
6. Continuos evaluation can be performed by organization to ensure they have a sufficient mapower to execute business strategy.

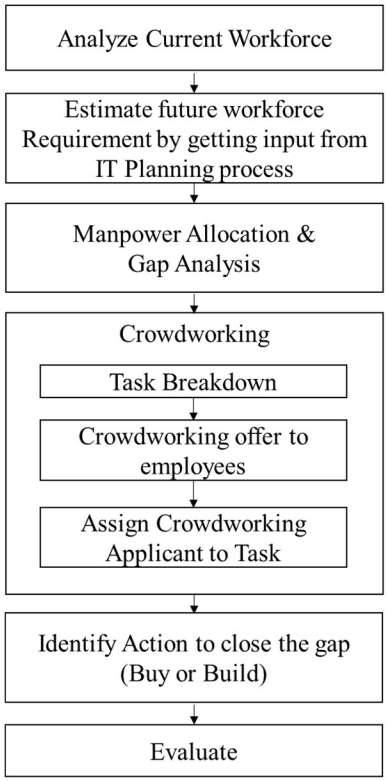


Figure 4: Workforce planning with internal crowdworking process feature

To give a better overview on process alignment between workforce planning and crowdworking, the design will be done by creating a use case diagram, a class diagram that will be used as a reference to help create a prototype.

4.4 Use Case Diagram

Use case diagrams are diagrams that can be used to describe the functionality of how a system is used [47]. The Use case diagram that will be created for prototype development will have 3 actors, that includes users from the IT function, users from the HR function, and employees that will have role as internal crowdworking user. The process will be explained in figure 6 (Appendix A):

1. IT users input approved IT projects into the system and perform manpower planning requirement to support the IT projects that has been created. Manpower planning that has been created will be used as an input to estimate future IT workforce requirement.
2. HR users maintain workforce attributes which include skills and employee working history, that will be used in project member assignment process. Employee data available in the system will be used as a source of information for current IT workforce analysis.
3. For each project's manpower requirement, IT users select existing employees to fill the team member needs to be assigned to the project. In addition, IT users can post on crowdworking platform, using crowdworking features if needed.
4. After the tasks available for crowdsourcing are available, the crowdsourcing user or internal employees within the bank can access the available crowdworking opportunities, then make application into that job or IT project requirements.
5. Employees that have already applied will become crowd worker candidates which will go through the selection process by IT users.
6. IT users can view crowdworking applicants on the project team member selection menu. The selection process will be assisted by skill matching features to support IT users to determine which is the best candidate for that specific position or requirement. This feature created to avoids the risk of a mismatch between employee and job or task requirement [8].
7. If the gap still cannot be closed through crowdworking, IT users can create hiring requests to submit requests for new employee recruitment and training requests to submit employee training needs.
8. IT and HR functions continuously evaluate the above process.

4.5 Class Diagram

Class diagrams are used to describe the objects and structure of a system, which supports system design process to understand system requirements and components [48], for the objects and structure of the workforce planning support system to be built, this is explained in Figure 7 (Appendix A).

This class diagram can be used as a future reference and can be modified or customized to accommodate organization requirements. For example, if the organization already has their own HRIS then, some features or information is not required to be available in the system then organization can utilize the exisitng system and have it intergrated with this system. Integration can be done either using API (application programming interface) or other integration methodology that available on the organization.

5. INTERVIEW, FOCUS GROUP DISCUSSION

Interview and Focus group discussions which often used in qualitative approach to gain deep

understanding of social issues [49] were conducted to obtain experts acceptance or feedback on the model that has been prepared. Interview and FGD are conducted with experts who has a significant experience and knowledge in the human resource planning and IT planning process, discussion itself is conducted with experts that's on managerial level up to Senior Vice President level which currently still actively working at leading Bank that has digital banking products in Indonesia which includes:

Interview

1. SVP Human Resources practitioner (Major Private Bank in Indonesia that has digital banking product) that has more than 19 years working experiences that includes 10 years of experience in the Human Resources banking industry which includes HR technology experience, HR business partnership and HR planning.
2. VP Human Resources practitioner (Major Private Bank in Indonesia that has digital banking product) that has more than 17 years working experience, including 7 years of experience in the Human Resources banking industry which includes HR recruitment and HR business partnership exposure
3. VP Information Technology (Major Private Bank in Indonesia that has digital banking product) who has more than 12 years of experience in IT in the banking industry and 5 years experiences in big 4 IT consulting. Currently heading the IT Business Enablement department which includes the Bank's Human Resources directorate.
4. Senior Manager Human Resources budgeting that has more than 5 years of experience in business planning and human resources budgeting.
5. SVP Anti-fraud Management that has more than 14 years of experience in risk management, audit, AML and anti-fraud management.

Focus Group Discussion

1. VP Human Resources Business Partner (Major Private Bank in Indonesia that has digital banking product) who has more than 10 years of experience in HR in the banking industry.
2. VP Information Technology (Major Private Bank in Indonesia that has digital banking product) who has more than 12 years of experience in IT in the banking industry and 5 years experiences in big 4 IT consulting. Currently heading the IT Business Enablement department which includes the Bank's Human Resources directorate.
3. VP Human Resources Budget Management (Major Private Bank in Indonesia that has a digital banking product) who has more than 10 years of experience in HR in the banking industry including the Bank's HR planning process (Manpower Planning).
4. AVP HR Technology (Major private Bank that has a digital banking product) who has more than 10 years of experience in HR System implementation as a consultant or as a HR System project leader in the banking industry.
5. Senior Manager of Human Resources Outsourcing Management (Major private Bank that has digital banking products) who has more than 10 years of experience in the banking industry including being responsible for the employee recruitment process and management of outsourcing employees at the Bank.
6. Manager of HR Talent Acquisition (Major private Bank that has digital banking products), who is responsible for the Bank's information technology employee recruitment process.

In general, interview and focus group discussion participants agreed with the background that was considered relevant to the current conditions. Based on the results of the focus group discussion, these FGD participants also assessed that the model discussed was in line with the current planning process in the organization, but the crowdworking concept itself has not been implemented in IT function, however, this IT workforce planning with crowdworking model are considered will be able to help organization in minimizing manpower requirement gap. It was found that a similar concept had been implemented at one of the major bank in Indonesia, however there is no available system to support this process and limited to Human Resources Directorate, where Human Resources employees can be given more responsibility to try other positions in the hope of gaining experience and knowledge outside of their current job.

In addition, in the IT and Digital Banking directorates, it was found that the concept explained was similar to the agile methodology currently running in the IT directorate, where usually a project is run in several iterations, where each iteration can be run by a different person, but once again it was found that there was no system used to help manage this process. Including in the HRIS currently used by the Bank, according to the explanation we received from the source responsible for the implementation of the Bank's HRIS.

Apart from that, the expert also stated that while implementing internal crowdworking in organization, change management need to be inplace to ensure that line managers is supportive to provide opportunities for their subordinates to participate in banks internal crowdworking programs.

Some of the input received in this FGD includes:

1. Input to adopt open API concept, because almost all banks, especially large banks, already have an HRIS system that can be integrated with the developed model to avoid duplication process in maintaining human resources data.
2. Concern over data confidentiality was also raised during the discussion, it was mentioned that the crowdworking model can be applied in the banking industry but is limited to the internal scope of bank employees (internal crowdworking).
3. The model is expected to also help recommend suitable candidates to fill the open positions, for example through skill or competency suitability
4. A filtering feature needs to be added to improve the quality of applicant compatibility with the current job openings in the Company. This is important to improve system operation efficiency.

In this research interview also conducted with Workday business manager to get feedback on the proposed HR planning model with Crowdworking, after getting the explanation on how this model works, the experts mention that currently Workday has a career hub module where the concept is quite in line with the crowdworking feature, where users can post internal crowdworking opportunities that can be applied by employees. It is hoped that this feature can be used as part of the individual employee development process. However, currently there is no feature to map project needs with a career hub which can be used in the employee development process that is mapped with the skills needed. The model explained by the researcher is considered to have novelty in terms of the absence of mapping between the HR planning process and the process carried out through the career hub module, so it is interesting to explore further.

6. DEMONSTRATION

Demonstration and evaluation process will be conducted through case study in one of major Bank in Indonesia that also has Digital Banking product. Bank with digital banking product was chosen in this study because most of them are facing problem with digital talent situation [2].

After the design and development process of the model is completed, the research continued with a demonstration process that will produce a web base application prototype, which using web-based client side (HTML, CSS, JavaScript) and web-based server based (PHP, MySQL). Prototype model are developed using output from design model that has been developed on design process such as use case and class diagram as a system requirement document.

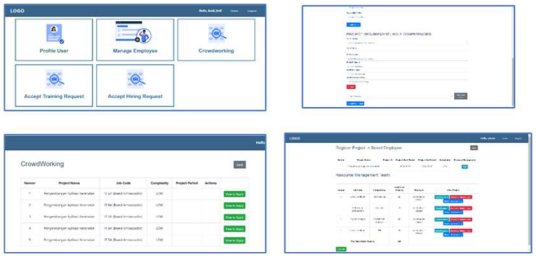


Figure 8: Selected Prototype User Interface

Selected prototype user interface of some of the main key processes of prototype can be seen on figure 10, figure 11, figure 12, figure 13, figure 14 (Appendix B).

Some of the system interface or functions can be modified or even eliminated to accommodate organization requirements. For example, if the organization already has their own HRIS then, some table is not required to be developed in the system and can, if possible, to adopt open API concept to have an integration among those systems.

7. EVALUATION

The evaluation process in design science research method, aims to measure whether the artifacts produced in the design process can help solve the problems discussed in the study [50]. The evaluation process that will be carried out in this study is carried out through the user acceptance test process using black box testing techniques, with software quality measurements using ISO/IEC 25010. Evaluation of the prototype created will be carried out at one of the banks that has a digital banking product. After conducting evaluation through prototype testing, additional evaluation will be conducted through expert judgement evaluation. Expert judgement from on this studies will be done through discussion with VP HR Business Partners which responsibles for IT & Operations and Human Resources functions, and

HR Technology Division Head from manjor bank in Indonesia that has digital Banking product.

7.1 Prototype Acceptance Testing

UAT script that will be used as a guideline for tester who run this testing process shown in table 2 (Appendix A), each of the UAT script item are reflecting use case that has been created on the earlier stages. The testing evaluation performed by FGD participants who have previously received an explanation of the planning model with crowdworking and have provided input to improve the suitability of the system to the needs of the HR planning process using crowdworking.

Evaluation process conducted through the UAT testing process which using black box testing method, by using ISO / IEC 25010 measurement and Expert judgement in addition to evaluate the prototype, the objective is to understand how is the model can support workforce planning and crowdworking process and model implementation potential in Indonesia Banking industry

Based on the UAT testing that run using UAT scripts which reflecting process model, all script was resulting "Passed" on each UAT script, all test scripts can be run according to the expected results, and there were several comments or inputs given to several items, which can be used as a point of improvement for the future research.

Several use cases that received notes or input from tester are grouped under passed with notes category which includes users can access IT projects to see details of IT projects and select project team members from crowdworking users who registered as crowdworking candidates, HR users can add competency attributes owned by employees and historical projects that have been carried out by employees, and users can submit training requests.

Software quality measurements for the prototype using ISO/IEC 25010 evaluation are explained in table 3 (Appendix A). From the results of the prototype quality test using ISO 25010 measurements, it shows that the prototype produces a very good value with an average value of 97% which explains that users assess the prototype tested in the UAT process as having a very good quality of model use and product model quality. Summary of ISO 25010 measurement can be seen on figure 5.

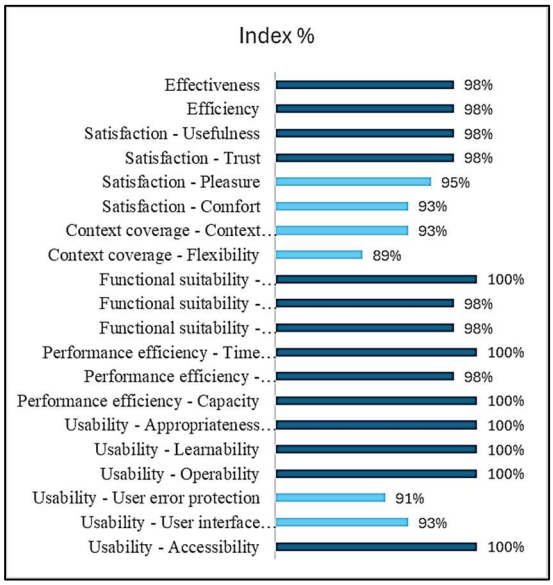


Figure 5: Evaluation ISO 25010 Summary

From the results of the quality of the model characteristics created, it also shows that the measurement of each model characteristic also shows very good results. From the results of this test, an analysis was carried out on the characteristics that had the lowest value, although they were still in the very good category or above 80%. These characteristics include context of coverage - flexibility, usability - user error protection, usability - user interface aesthetics, context of coverage - completeness of context and satisfaction - pleasure.

In general, the results of this UAT prototype showing that the HR planning model with crowdworking that was developed can be adopted as a references to create alignment between IT worforce planning and crowdworking in the banking industry to be used as solutions to solve the problem of human resource gap in an organization. increase employee productivity and improve manpower cost efficiency.

7.2 Expert Judgement

From the results of the expert judgement interviews, it was found that the model created can be used as a reference to help the HR planning process with crowdworking, which can help companies to increase productivity, increase company efficiency and in the long term can reduce employee attrition.

Concept of internal crowdworking was once implemented in one of the banks in Indonesia which also has a digital banking product. However, in its implementation, it was only informed via

email and did not have a system to manage or plan the internal crowdworking process, and there is no taskbreakdown process performed on that process hence there is no clarity on what is the exact task need to be performed by employees. From this situation, expert mentioned that on the crowdworking description, Bank need to be clearly defined how many percentage of work time will be spent on carrying out one's role in crowdworking.

Other findings is, it is necessary to ensure the suitability of employee backgrounds, and it should be limited to generic roles. In addition, it is better if this internal crowdworking is not opened for key positions in a project. Possible difficulties in implementing the HR planning model with crowdworking are the culture in the company, especially to ensure how line managers provide opportunities for their teams to participate in crowdworking programs. Where added by other experts, there needs to be approval and support from the Board of Directors in this implementation. And the HR planning process with crowdworking is also said need to be inline with the performance management and compensation management processes.

There is interesting input from the expert, in the implementation of crowdworking, namely as a model development after the first phase of crowdworking implementation, once a big crowdworking pool already available, IT users can select users who have registered for crowdworking but have not yet received an opportunity so that they can be offered a crowdworking opportunity if there is a position that is deemed suitable.

From the HR Technology architecture perspective, it was found that major banks in Indonesia generally already have HRIS that has been implemented to support the bank's HR management process, so it is necessary to conduct a study on whether the scope of this crowdworking can be built on the HRIS so that the investment required is not too large because in terms of infrastructure, it can use the available platform.

8. CONCLUSIONS AND SUGGESTION

This study presents a model for IT workforce planning with crowdworking in the Indonesian banking industry, which addressing the challenges of digital transformation and talent scarcity. Our model, developed through a design science research methodology, offers a structured model that aligning IT workforce planning with IT strategic objectives, analysing current and future workforce needs, and adopting crowdworking approach. The model's six key features provide a comprehensive approach to IT workforce planning, from analyse current workflow to process evaluation, in addition to that we have also add internal crowdworking as an alternative solution to solve manpower requirement gap which can improve internal employee's productivity.

The findings suggest that this model can significantly enhance the IT workforce planning process in banks, particularly in improving alignment between HR and IT business objectives, which facilitating data-driven decision-making, and addressing the challenges of digital talent scarcity and improving workforce flexibility through crowdworking implementation. The system prototype demonstrates the model's practical applicability and potential for implementation.

This research contributes to both theoritical and practical by addressing the gap between general workforce planning and crowdworking models and the specific needs of IT departments in the banking industry. It provides a foundation for future research on IT workforce planning and crowdworking in digital transformation contexts and offers practical guidelines for banking professionals.

Limitations of this study include its focus on the Indonesian context and the relatively small sample of expert interviews. Future research should validate the model in different cultural contexts, explore its applicability in other industries, and conduct longitudinal studies to assess its long-term impact on IT workforce management and organizational performance.

Recommendation for future research is to implement this IT workforce planning model for full manpower planning cycle, so future reasearch can be conduct to measure the model impact on company manpower cost, employee productivity, cultural aspect and overall human resources management process.

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APPENDIX A:

Table 1: Workforce planning process guidelines

No	Process Component	CIPD	OPM	IPMA	IBM	OECD
1	Company's Strategic Direction Identification		✓		✓	✓
2	Organization & its environment analysis	✓	✓		✓	
3	Current Workforce Analysis	✓	✓	✓	✓	✓
4	Identify Future workforce needs	✓	✓	✓	✓	✓
5	Gap identification and how to minimize the gap	✓	✓	✓	✓	✓
6	Implement Action	✓	✓		✓	✓
7	Perform evaluation	✓	✓		✓	✓

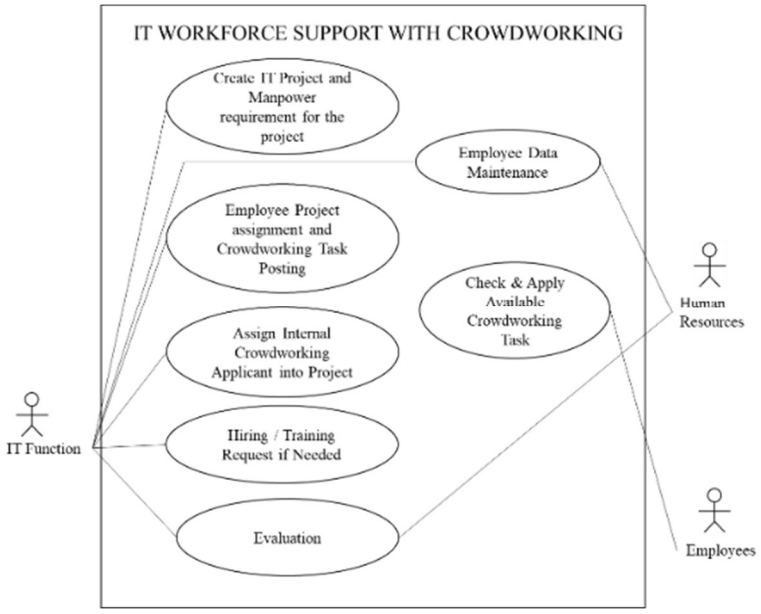

Figure 6: IT Workforce Planning Support System with Crowdworking

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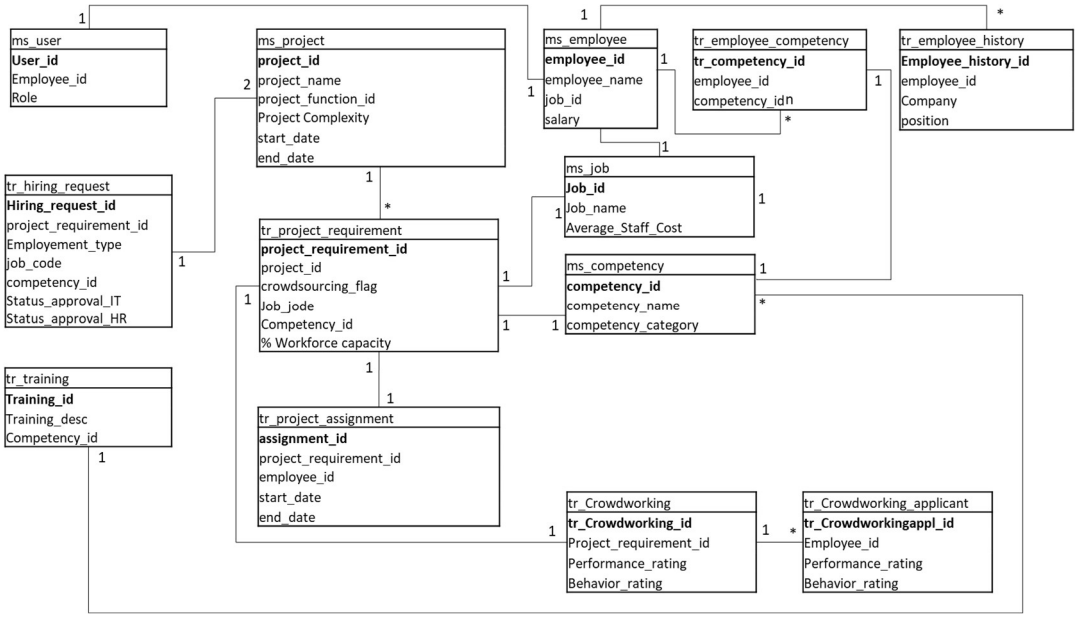

Figure 7: Class Diagram Workforce Planning Support with Crowdworking Model

Table 2: Evaluation User Acceptance Test UAT Result

Actor	Use Case / Step	Expected Result/UAT Test Script
IT User	Login	IT users can log in and access the project management and crowdworking menus.
	Manage IT Project	Users can access the IT Project menu
		Users can see a list of available projects.
		Users can create new projects and change the attributes of previously created IT projects.
		Users can access IT projects to view IT project details and select project team members.
		Users can access IT projects to see details of IT projects and select project team members from crowdworking users who register as crowdworking candidates.
	Manage Hiring	Users can submit a hiring request
HR User	Login	IT users can log in and access the employee and crowdworking menus.
	Manage Employee	Users can access the Employee menu
		Users can see the list of available employees.
		HR users can add competency attributes that employees have and historical projects that have been carried out by employees.
	Manage Hiring	User can approve Hiring request
	Manage Training	Users can approve training requests
Employees	Login	IT users can log in and access the crowdworking menu.
	Crowdworking	Users can see a list of available crowdworking vacancies.
		Users can access the crowdworking list they want to access.
		Users can view the attributes of crowdworking vacancies.
		Users can register for the crowdworking vacancies they want.
	Manage training	Users can submit training requests

Table 3: Evaluation ISO 25010 Result

Measurement Model	Characteristics	Sub-Characteristics	Total Score	Index Score
Quality in use Model	Effectiveness		43	98%
	Efficiency		43	98%
	Satisfaction	Usefulness	43	98%
	Satisfaction	Trust	43	98%
	Satisfaction	Pleasure	42	95%
	Satisfaction	Comfort	41	93%
	Context coverage	Context completeness	41	93%
	Context coverage	Flexibility	39	89%
Product Quality Model	Functional suitability	Functional completeness	44	100%
	Functional suitability	Functional correctness	43	98%
	Functional suitability	Functional appropriateness	43	98%
	Performance efficiency	Time behaviour	44	100%
	Performance efficiency	Resource utilization	43	98%
	Performance efficiency	Capacity	44	100%
	Usability	Appropriateness recognizability	44	100%
	Usability	Learnability	44	100%
	Usability	Operability	44	100%
	Usability	User error protection	40	91%
	Usability	User interface aesthetics	41	93%
	Usability	Accessibility	44	100%

APPENDIX B:

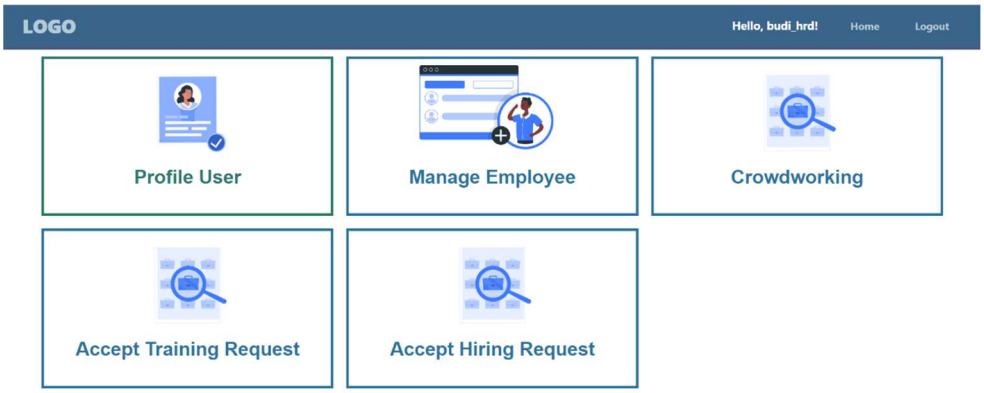

Figure 10: UI Landing Page User HR

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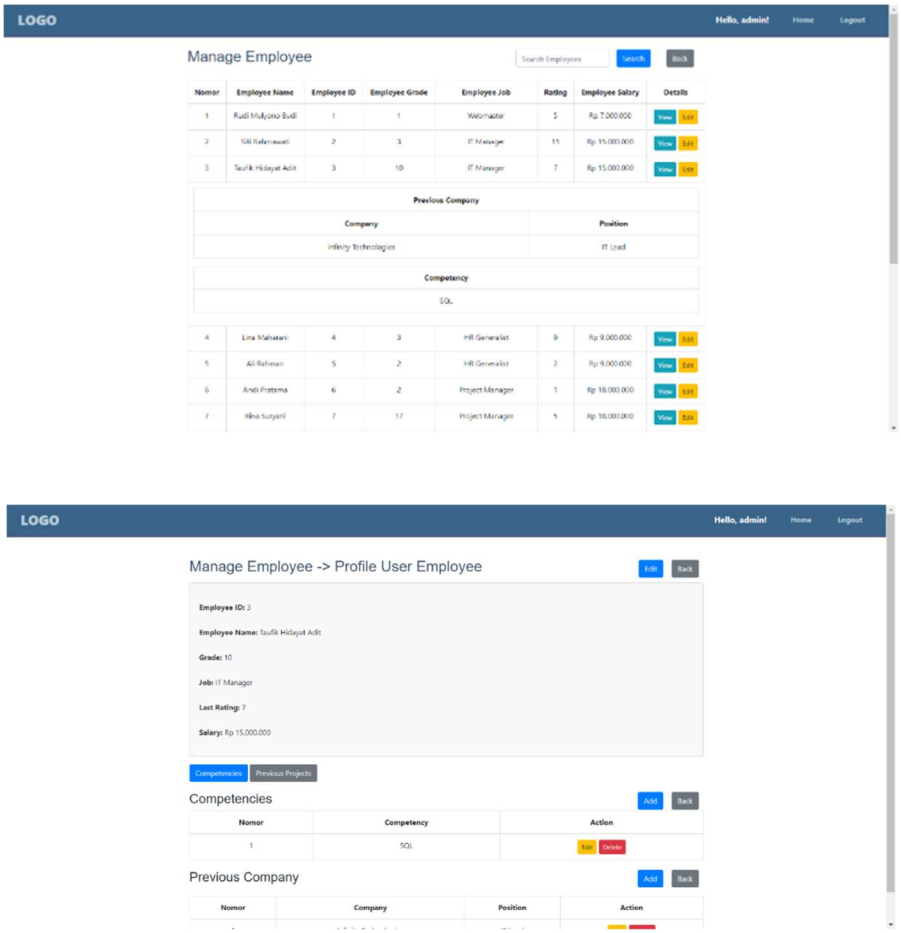

Figure 11: UI Manage Employee Menu

Figure 12: UI Landing Page User IT

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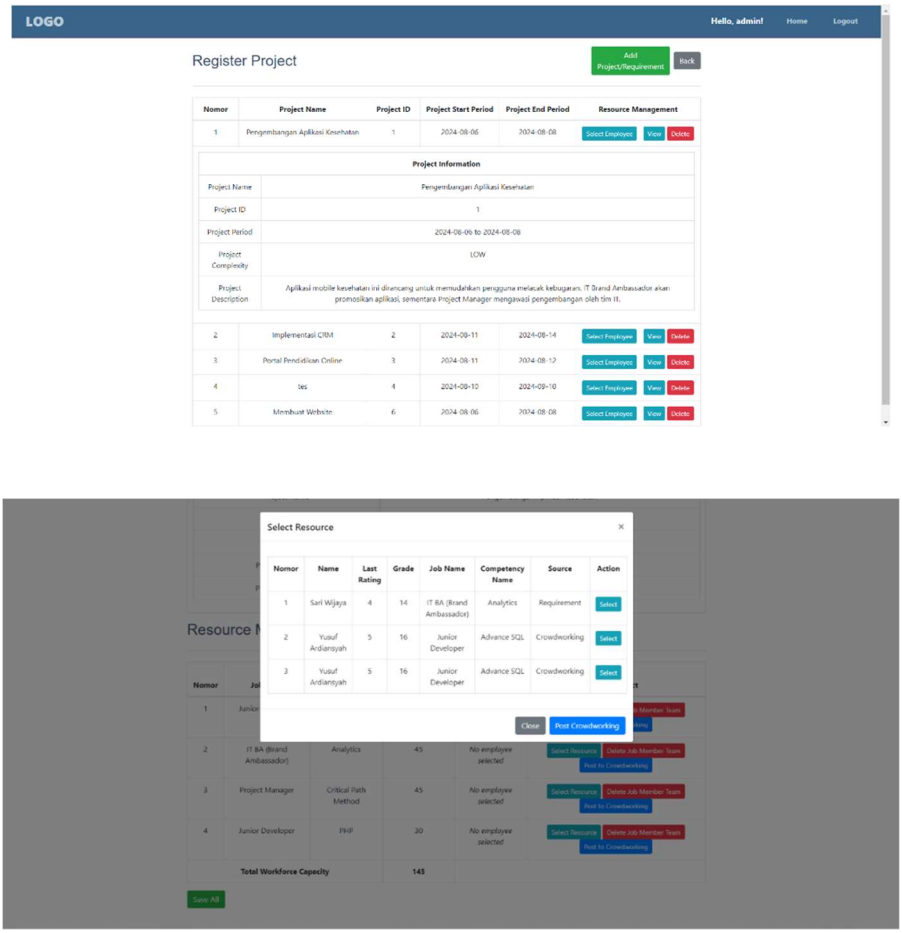

Figure 13: UI Manage Project & Select Project Resources Menu

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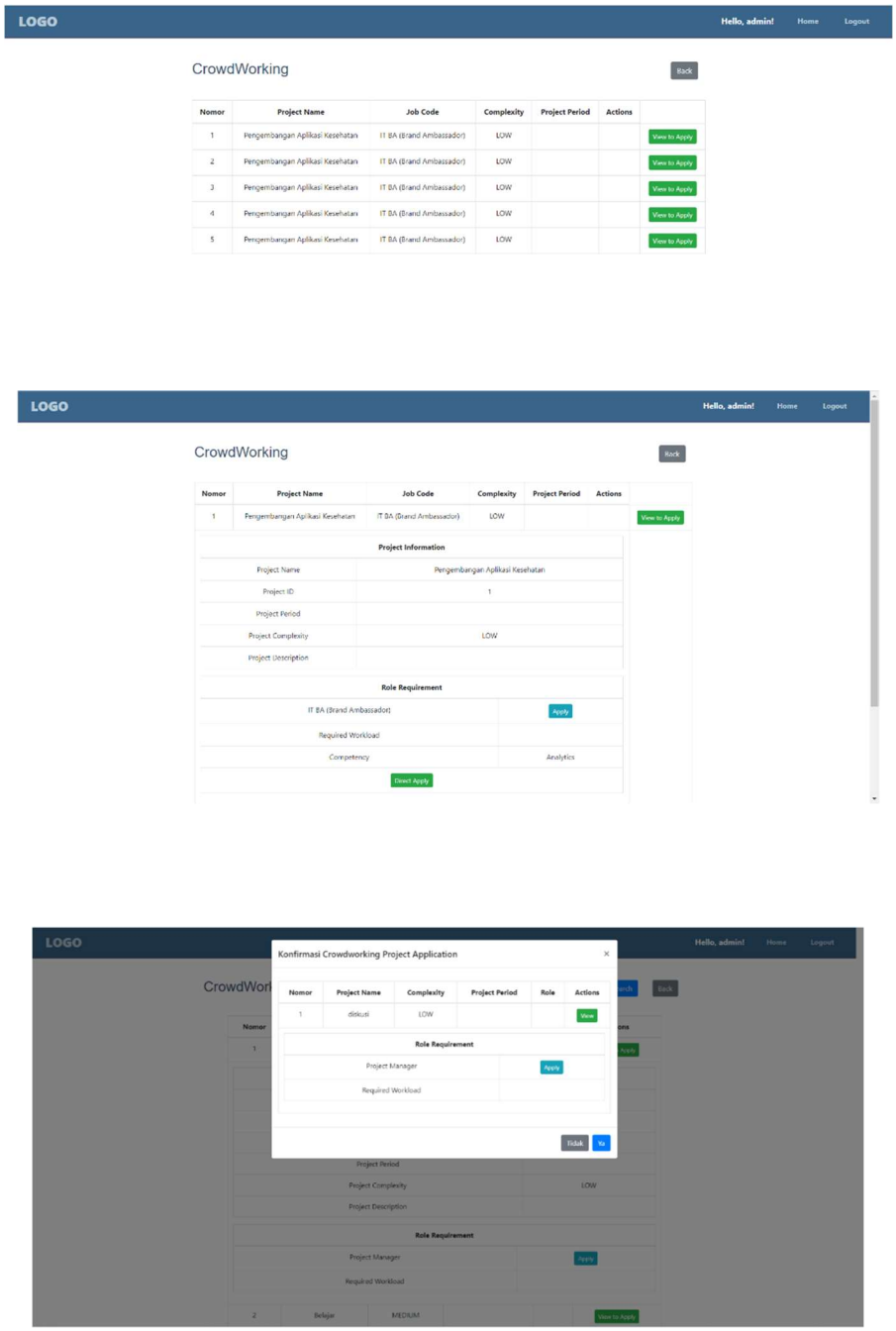

Figure 14: UI Crowdworking Menu