Gig Work Business Process Improvement

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Abstract—We collaborate with a gig work platform company (GPC) in Switzerland. The project aims to improve the business by influencing process management within the GPC, providing automated matching of jobs to workers, improving worker acquisition and worker commitment, and particularly focusing on the prevention of no shows. One expects to achieve financial, organizational and efficiency gains. As research tools we use a combination of text mining and sentiment analysis, Business Process Modeling and Notation (BPMN), interviews with workers and employers, and the design of sociotechnical improvements to the process, including platform improvements and prototypes. Here, we focus on the successful combination of BPMN modelling with sentiment analysis in the identification of problems and generation of ideas for future modifications to the business processes.

Keywords- sentiment analysis, Business Process Modeling and Notation, business process improvement, gig work

I. INTRODUCTION

Modern societies are developing towards more flexible work structures because of personal requirements and business needs. On the one hand, having a part time job has become more attractive to many people, as one can better balance work with family, education, leisure, or other responsibilities. On the other hand, various forms of temporary work allow companies and other institutions to be more flexible and accommodating with respect to changing business needs while avoiding high fixed costs associated with a permanent workforce.

Gig work is a flexible work form which assumes employment for a rather short period, for instance during an event like a concert or a fair. Establishing such short time work relationships is difficult because employers and employees usually do not know each other in advance and the coordination effort should be kept small to reduce cost. It is therefore obvious to involve intermediaries for job placements and digital platforms for an efficient employment service.

There are, however, many risks and dangers during an increasingly automatized job placement. For instance, an electronic platform must be both reliable and attractive for both job seekers and employers. It must be clear, especially for newbie job seekers, which information they need to provide and how the processes work. The platform needs to gather relevant information about qualifications, skills, or work experience, without causing too much effort for the participants. The information provided by the job applicants needs to be analyzed and utilized during the job matching process. A matching between a job offer and a worker needs to be confirmed by both parties and frequently further details

or instructions need to be provided before the actual work starts, as often there is no face-to-face meeting between the employer and worker in advance of the job. Then there may be problems during the execution of work, which might involve the electronic platform. Finally, after work, a mutual rating of the work satisfaction from both parties is useful for subsequent job placements.

In an ongoing project, we work with a gig work platform company (GPC), which acts as a broker for gig work opportunities. A large part of their services is based on an electronic platform, where the employers post job opportunities and job seekers register and build a profile. We focus, on the one hand, on improved communication on the platform, especially community building, and on increasing the retention of job seekers. On the other hand, the business processes should be improved, for instance via better data analysis and text mining. Our contributions are as follows. We analyze the processes in the current platform, identify weaknesses, and suggest improvements regarding process efficiency and stakeholder satisfaction. We also report on the usage of tools for text mining and data analysis, for a sentiment analysis of employer and employee ratings and on reasons for future work on automatic CV analysis.

The paper is structured as follows. In Section II we discuss selected related work and in Section III the research questions and methodology. Section IV describes process improvements to the gig work platform and Section V, text mining, particularly the problem of no shows. We conclude in Section VI.

II. RELATED WORK

Last few years have experienced a growing research interest in gig economy with a significant number of publications. Dividing lines between gig work and other permanent and temporary forms of labor are being established [19]. One main concern is the analysis of benefits and risks of gig work, especially from the viewpoint of workers and society [6] [4]. Although the rise of gig work is driven by modern information technology, especially digital platforms and the ubiquity of mobile devices [12], it can be observed that such work forms were also frequently used during earlier periods [18]. Apparently, 20 to 30 per cent of the working-age population in the United States and the European Union engage in various forms of independent work [12].

It is not easy to distinguish gig work from other modern forms of work such as crowd sourcing/crowd work or on-demand work. Frequently, gig work is classified according to the reasons the employees give to choose gig work depending on their situation, e.g. bridge employment (temporary

employment between career jobs or between full-time work and retirement) or for generating income when circumstances do not accommodate traditional full-time work [4]. In [3] two basic forms are distinguished, the completion of a series of tasks through online platforms and the work on demand via app which refers to traditional working activities conciliated by an online platform which is usually accessed by mobile devices. Schmidt [17] distinguishes six basic types of digital labor, subdivided according to work location. Web-based digital labor (cloud work) is divided into (1) freelance marketplaces, (2) microtasking crowd work, and (3) contest-based creative crowd work, while gig work (location-based digital labor) includes (4) accommodation, (5) transportation and delivery services, and (6) household and personal services.

As already mentioned, many publications address challenges and risks for workers from a legal point of view, social security perspective, regulatory issues, or other aspects relating to policy making. There is, however, not much research regarding the design of digital platforms or business processes used in mediating and conducting gig work. There is little empirical knowledge about the existing platforms or design research issues. For example, one report [11] based on 30 worker interviews finds diverse structural constraints (availability of work and degree of worker dependence on the work) as well as cultural-cognitive constraints (procrastination and presenteeism) limiting the worker's self-determination. In [13] the authors investigate the relationship between worker motivation and the level of support they receive, leading to a higher level of commitment. Kenney and Zysman [9] [10] address some general aspects of the design of digital platforms for the gig economy such as the algorithm control of processes or the usage of big data. Although there are hardly any publications regarding the design of specific gig work platforms or business processes including data analysis, we can draw on literature in the areas of business process management, software usability, natural language processing and text mining, to which we refer in the following.

III. RESEARCH METHODS AND QUESTIONS

We use the methodology of business process management to achieve business improvement [20]. The processes we identified are core to company operations and their analysis is the starting point in process reengineering. The five processes we focus on in Section IV are largely executed via the software platform and are vital for company success, as they start with establishing a contract and end with a payment.

In requirements elicitation [16] [21] one can use a mixture of techniques, including the following:
• survey methods: interview, questionnaire
• creativity approaches: brainstorming, change of perspective
• document-centric work: system archeology, perspective-based reading, process modelling
• observation techniques: field observation, apprenticing.

We opted for process modelling as elicitation method for the following reasons. First, information about the existing processes and activities was available in issue tracking software. Using information directly from this source ensured close interaction with ongoing software engineering activities and allowed us to avoid generating redundant or inaccurate information. The second reason was that the tracking software included all the screens used in the platform system and those could be mapped directly to process activities (i.e. mapping task – role – data). Thirdly, process modelling allowed us to break down the processes into single atomic activities which is a perfect basis for subsequent process optimization. Fourthly, process modelling supports the identification of the control flow (sequence of activities), information flow (relationship of activities to data items) and interfaces with other processes. This allowed us to identify gaps and propose new features for the gig work platform. Fifthly, once the processes have been modelled, they can be optimised using Key Performance Indicators (KPIs) which were defined by the gig platform company at the beginning of the project. And the sixth reason which proved to be very important was that a process model is an easy way of communicating with the gig company and other project participants and can be used to unify and visualize findings coming from other methods, including interviews, brainstorming and field observation.

We shortly outline the research questions. The gig work platform company (GPC) we collaborate with is very successful in the provision of temporary labor at a short notice. In most cases it can confirm worker availability within a few hours of getting an order. The main problems as perceived by the company were the recruitment of new workers (onboarding with the company), matching the workers to the job descriptions for a job at hand, and preventing no-shows (where the workers say they are available but do not turn up without informing the company ahead of time). This paper focuses on two aspects: the recruitment process as part of the platform and understanding the problem of no shows. Ongoing work is addressing the issue of matching workers to jobs.

The business process analysis [14] was carried out and recorded using Business Process Analysis and Notation (BPMN) as follows. We attended a presentation about the platform, followed by a system demo and questions. We had access to a test system and the company wiki housing the design documentation listing the implemented features. We drew the BPMN processes based on this information and discussed the findings with the company. Refinements to the BPMN diagrams were made and the results were deposited in the company wiki [1] and used as a basis for further research. We described the business process in terms of the interaction between the GPC, and their customers: the employers and employees (gig workers), which leads to three lanes in BPMN diagrams (worker, platform company, employer), in Fig. 1, where all participants are modelled in one pool, because they share one marketplace. The analysis outcomes and improvement suggestions are described in Section IV.

In the no-show case, workers would agree to do the job and not turn up. To understand the no show and the employee motivation and performance we were given access to circa
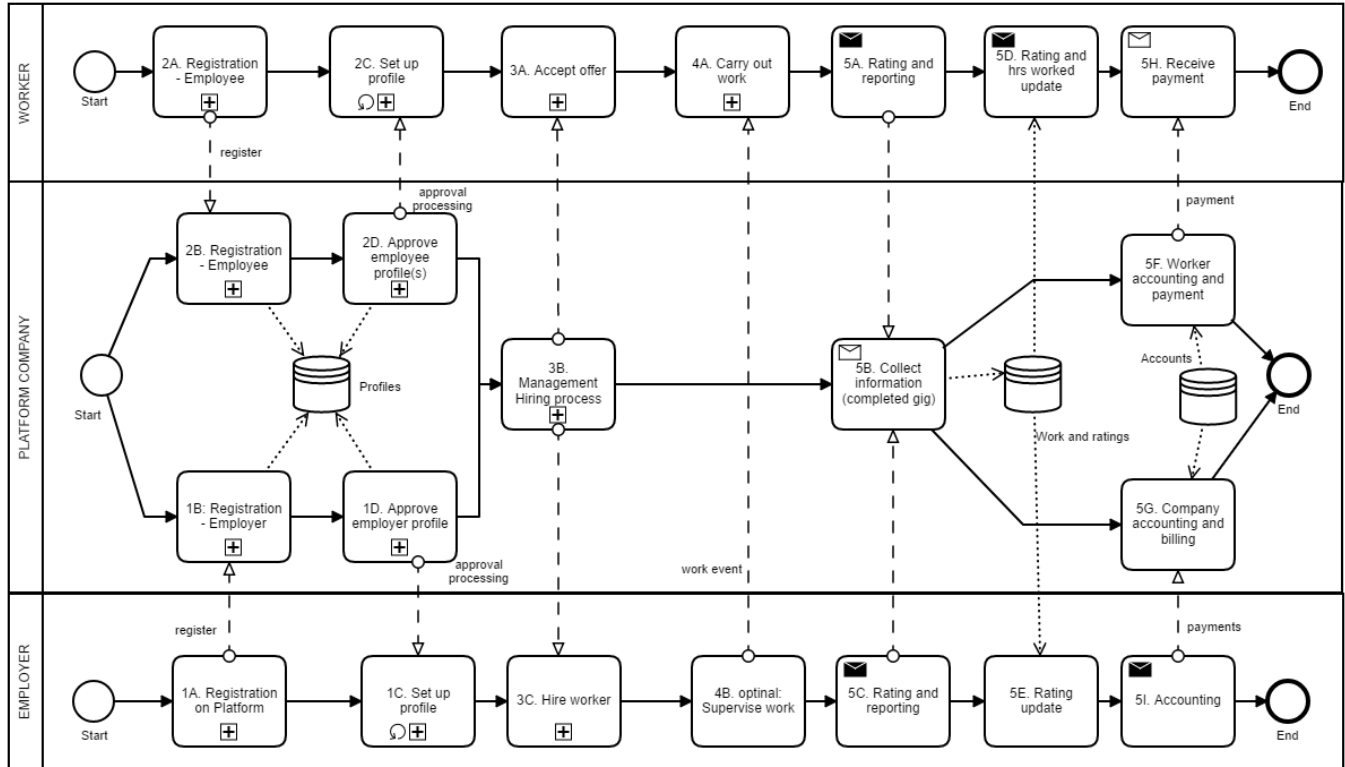
Figure 1. Gig work process overview showing the worker lane, the platform company lane and the employer lane. Processes are numbered 1-5, with letters beside the number, not necessarily corresponding to the order of activities performed. Process 1 EMPLOYER REGISTRATION AND PROFILING is visible in the bottom left part of the figure in lanes EMPLOYER and PLATFORM COMPANY (1A to 1D). Process 2 EMPLOYEE REGISTRATION AND PROFILING is shown in the top left part in lanes WORKER and PLATFORM COMPANY (2A to 2D). Process 3 GIG INITIATION – MANAGEMENT - HIRING is in the center of lane PLATFORM COMPANY and stretches to the other two business partners (3A to 3C). Process 4 (4A and 4B) is outside the platform! Process 5 GIG CLOSURE involves all three lanes and concludes each work transaction (5A to 5I). All participants are modeled in one pool, because they share one marketplace.

15'000 worker and employer comments consisting of an ID, time, rating and the comment itself. We used text mining and machine learning in Python to implement a sentiment analysis pipeline and visualization, as detailed in Section V.

IV. PROCESS REENGINEERING

The main gig work business processes, see Fig. 1, are:
• Process 1. Employer registration and profiling
• Process 2. Employee registration and profiling
• Process 3. Gig initiation - Management - Hiring: contracting a single job, including job-worker matching
• Process 4. Gig execution (the job)
• Process 5. Gig closure - reporting, rating and payments.
Based on a brainstorming with GPC it turned out that two processes, Process 2 "Employee profiling" and 4 "Gig execution" are to be the focus of our work initially and Process 2 especially needs re-engineering [7] [8]. The main reason for that is that currently a high bounce rate during employee profiling is observed. Process 4, to everyone's surprise, is outside the platform and the GPC has no control over it. We elaborate on this in Section IV.

A. Process 2 "Employee registration and profiling"

Process 2, Fig. 2, is currently implemented as a menu of items a future worker can add to their profile (*curriculum*

vitae (CV), photo, ID, RTW (right to work), job profiles, payment details, geographical availability, job certificates, possible references). When all the necessary elements are in the system, GPC reviews the data, particularly checking if a candidate has a work permit, has the required qualifications and experience, and fits the profiles they register for, and the worker is notified that they are potentially employable within the selected job profile(s).

The worker has the option to set their status to inactive and can accept a special status of being a worker "dedicated" to work for an employer. This may happen when an employer with a pool of known workers joins the GPC who then manage the employer's pool and provide extra workforce to suit the changing needs of the employer.

GPC manages the applicants, including not approving the worker as eligible for work at all, blocking the worker for a company (for instance based on company preference or bad ratings), blocking the worker for a job profile, or "dedicating" a worker to a company.

GPC maintains a pool of job profiles which are job types with the required qualifications and experience. GPC creates new profiles as needed for the companies they serve. The worker selects job profiles (up to 10 profiles currently). GPC verifies that a worker fits a profile by looking up the CV and other paperwork submitted to the platform by a job candidate.
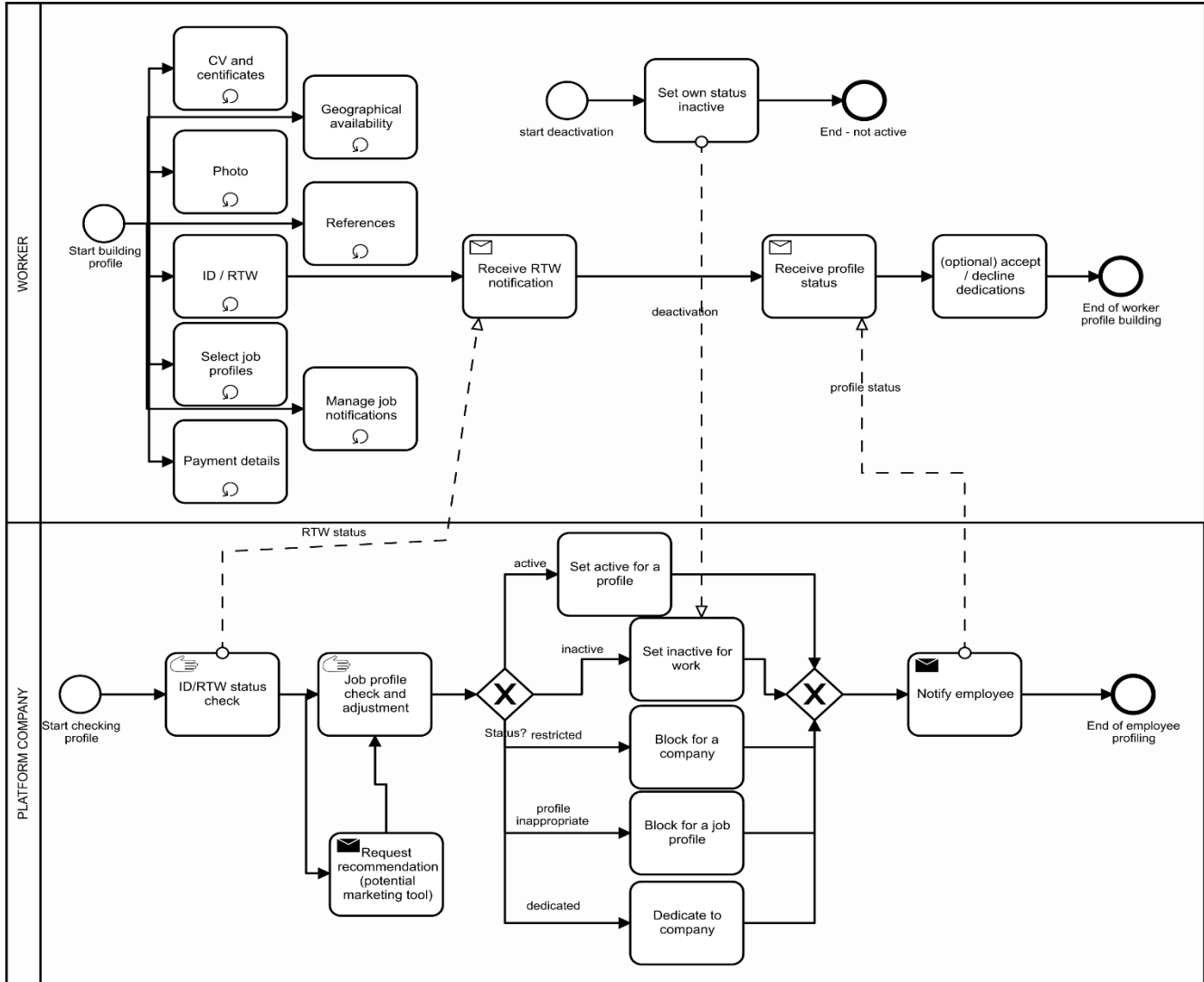
Figure 2. Process 2, "Employee registration and profiling". The worker (top lane) uploads the paperwork and selects job profiles. She receives a notification for RTW and approval for the job profiles registered for and can accept being a dedicated worker. The platform company (bottom lane) checks all the incoming documents and decides if the worker fits the job profiles they registered for. GPC will then notify the employee of their status. The participants are modeled in one pool, because they share one marketplace.

B. Process 4 "Gig execution"

"Gig execution" turned out to be an eye-opener. During this process various problems arise and cannot be addressed immediately, as the interactions are not mediated by the platform or directly known to the GPC. In an ideal scenario, the potential employer sends the workers all the required information (time, place, dress, type of job, extra requirements, contacts if problems arise). Then the worker turns up for work and does the job. The employer coordinates the work, and possibly supervises it. Afterwards, as part of Process 5 (Gig closure), the worker submits a timesheet and a job rating, and the employer confirms the times and submits a worker rating.

The ratings are expressed as stars (1 to 4 stars). If the rating is low (1 to 2 stars), the rater has to explain the poor rating by proving a comment which is currently kept private by the GPC and can be used to improve the business process. Here is an overview of the problems we saw. On the employer side, three groups of problems were noted.

• We see inadequate communication with the workers before, during the job, and during the sign off. This included inadequate instructions (travel directions, dress, expectations, contact details, required flexibility), no onboarding on the job and no sign-off after the job, with possible lack of agreement on the time spent on the job, leading to problems with the paycheck.

• Workers report inadequate supervision or contact in case of unforeseen difficulties, poor work organization, or the management being impolite or military style

• Workers report problems with statutory breaks during work time or the length of the working day.

On the worker side we observe two types of issues.

• We see unprofessional approach to work: the worker does not turn up or is late without informing anyone, or leaves the job before the end. The worker does not have the clothing required for the job or does not understand the dress code (hair color, nail color, shoe type or color, dress).

• Employers comment on poor work quality (worker talks on the phone while on the job, is disinterested, the skill level is inadequate, worker is impolite).

C. Process optimization

Process optimization is performed as follows:
a. Identifying the "Critical to quality" points (CTQ points)
b. Deriving key performance indicators (KPI)
c. Collecting baseline data for current process performance
d. Optimizing the process based on the KPI
e. Measuring the performance of the optimized process

Important CTQ points related to "Employee profiling" are the time needed for profiling and the intuitiveness of the profiling steps, that is how easy it is to handle the various steps in the application process. In terms of KPI this can be transformed to "lead time" on the one side (time needed to create a profile) and "bounce rate of the Web application" (percentage of users who do not complete the profile) on the other side. We propose to use platform logs to make such measurements. The next step will be to apply business process optimization techniques to improve the KPIs. Cost cutting, for example, can be achieved by enhancing the platform with new functions to improve the process assuming that the quality of the activities will not deteriorate.

D. Improving employee registration and profiling

This could be done in the following ways:

• Improving the user interface to offer **feedback on the completeness of the registration** process (for instance showing % complete and highlighting the missing items).

• Providing feedback on the progress not only visually in the app but also by SMS or mail (as **recommendations**). An important step for every user is to receive the status notification which is related to their ability to be selected for jobs.

• Streamlining tasks related to **uploading data**. Currently the user has to upload scanned documents (e.g. CV, certificates, ID, payment details). Very often the users leave the platform as they are overwhelmed by the complexity of the process. To speed up this step, data collection could be designed in a more user-friendly way, for instance by integrating the camera button where a document could be photographed from a mobile phone or allowing for data upload from social platforms or cloud solutions used by the worker.

• Collecting and using the information on **worker types**, for instance by asking them if they are a student, working parent, gig newcomer, professional gig worker, new to Switzerland, people having alternative life forms, or receive unemployment benefit. These personas (types) can then be used to optimize the job profiling step. Additionally,

prospective employees will know then that their attitudes and expectations will be taken seriously, which may increase their interest and help reduce the bounce rate.

• Designing a text mining module which can extract information automatically from CVs and ask the worker only to confirm the facts after they have been extracted from the CV.

• Extending the text mining module to recommend the job profiles a worker could register for.

E. Improving gig work execution

The main weaknesses are that the preparation of an employee for the gig is not supported by the platform and there is too little support on the job. Improvements currently under investigation are the following:

• **A communication channel employer-worker and worker-worker** could support direct exchange prior to the job, on the job, and afterwards. One could use a messenger app with group functionality. For each new gig, the employer would invite all the workers and they would then communicate as needed. Enhancing the platform with social media functionality would allow the workers to provide mutual support before and during the job. In complex scenarios (e.g. work to be carried out by multiple employees, sharing experiences among the employees, being completely new to the platform) the current platform could support creating, sharing, searching posts but also more demanding tasks like project management, managing appointments, shifts or sharing transport on the way to the gig.

• **A chat function on the platform** would allow the worker to contact the help desk and use an accumulated database of answers (FAQ) to get advice on various work-related issues.

We envisage that added communication tools would make the gig work scenario more personal and relevant to the job, to suit the individual needs of various types of workers. A feeling of belonging would be stronger for those who need it to work well and this might improve worker commitment and motivation and remove some of the causes of no show, which is a sign of low commitment and insecurity experienced by some workers.

V. No Shows

The main concern voiced by the platform company was the no show problem. Employers who rated the workers entered one star and a comment "no show". To get a full understanding of this problem one needs to do an analysis of all negative comments. Process improvement involves the following steps.

• Automated analysis of comments via text mining/sentiment analysis [2]. Only 5.5% of all the comments we received were marked with 1-2 stars, however a much larger % were negative, with machine learning being able to find the negative comments with an accuracy of 87%, F1 score 0.91, and the Matthews correlation coefficient of 0.65 [15]. The goal is to improve prediction accuracy to 95% by annotating

manually a larger corpus and tuning the machine learning methods.

• Using the sentiment analysis solution in the business context. This will be used at the end of each business period (day, week, month, quarter, or year) to find just the negative statements. The comments will be processed and presented as tables and visualizations in the following ways:

    a.   clustered by origin (employer/worker) and theme
    b.   per worker along a time axis showing the themes
    c.   about an event/gig clustered by theme
    d.   per employer along the time axis and theme

This form of feedback could be anonymized and fed back to both workers and employers.

VI. Conclusion and Outlook

We have analyzed and described a business process used by a leading gig work platform company in the acquisition of business partners, establishment of a gig work contract, monitoring of gig work execution and accounting. We show two BPMN models describing the relevant business activities: a process overview and details of worker registration and profiling. Of the five business processes described, two were investigated in depth: worker registration on the platform and gig work execution. We suggested possible process improvements and have created a prototype sentiment analysis solution which will allow us to understand the problem of no show and gig work execution problems. Future work includes collecting platform data with a focus on the KPIs and supporting the company in process optimization. We will produce prototype solutions to be evaluated in practice. The problem of job to worker matching will be addressed via text mining, using CV analysis and a job profile recommender system. We will study the usability of prototype mobile applications supporting the business process, to develop solutions that satisfy the user requirements and strengthen the market position of our business partner.

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