

ADOPTING COLLABORATIVE WORKFLOW PATTERN: USE CASE

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ABSTRACT

In recent years, the use of web 2.0 tools has increased in companies and organisation. This phenomenon, has modified common organisational and operative practices. This has led "knowledge workers" to change their working practices through the use of Web 2.0 communication tools. Unfortunately, these tools have not been integrated with existing enterprise information systems. This is an important problem in an organisational context because knowledge of information exchanged is needed. In previous works we demonstrate that it is possible to capture this knowledge using collaboration processes, which are processes of abstraction created in accordance with design patterns and applied to new organisational operative practices. In this article, we want to present the experience of the adoption of the methodology and the catalog of patterns from some pattern designers of a company operating in Public Administration and Finance, with the aim of shaping an information system Enterprise 2.0, which takes into account the collaborative processes.

KEYWORDS

Business Practices, Collaboration Process, Business Process Patterns, Enterprise 2.0, Web 2.0, Knowledge Workers & Collaboration Tools

1. INTRODUCTION

With the rise of Enterprise 2.0 systems, not only in big companies but also in organizations new collaborative working practices have been introduced, as defined by Nial Cook [1]. These will work in addition to the traditional business processes that define the procedure of operational organization. The collaborative processes are characterized by a strong and a non-default collaboration among the participants in the process in order to achieve common goals. The collaboration develops through the combination of traditional communication tools (e-mail, telephones and direct conversations) and web 2.0 tools (chat, social networks, blogs, etc...). The actors involved in a collaborative process can choose the preferred means of cooperation (communication). In addition, the company cannot define the set of enterprise available tools in advance: the individual employee is the only one who fully understands his needs and he must be able to build and change his own virtual working environment. The collaborative processes are key components for the management of the company; however, they are executed independently from legacy information systems. Therefore, there is a clear need to integrate collaborative processes with other processes and business information. In this way, their scope and their effectiveness will be amplified, as well as they should be integrated with information systems and business processes that are under the direct management control. Only in this way, the information generated by the communication tools Web 2.0 can become part of the corporate information assets. In the book "Human Interactions the hearth and soul of business process management" [2], it is shown that the heart of any organization is always people and that their

behaviors appear to be complex and non-default. However, this complexity must be managed. To ensure the success of an organization we need to find a new model to manage the complexity and constantly changing "human-driven" processes. You cannot consider workers as if they were simply "the gears of a machine." Therefore, first, we need to find a method to formally describe "human-driven" processes and then we can try to integrate them into a software tool that supports their execution. Nevertheless, all influence strongly on classical methods of modeling both of business processes and of information systems, requiring a radical change in perspective. The authors examine in depth the nature of the "human-driven" processes and they show how this, if properly designed, can be supported by the information systems of the next generation. To formally describe "human-driven" processes (as defined in [2]) and the interaction between man and technology, the identification of workflow design patterns can be a useful approach. This is demonstrated by the authors in the article [3], where the authors propose a catalog of workflow design patterns with different granularity levels, through which the designer can get a very detailed modeling processes. A design pattern is a concept that can be defined as "a general design solution to a recurring problem". It gives him a name; abstracts and identifies the key aspects of the structure used for the solution of the problem; identifies the classes, participant instances and the distribution of responsibilities; describes when and how it can be applied. In short, it defines a problem, the typical contexts in which it is located and the optimal solution. Once you have identified the patterns of business processes, these can be used for the re-engineering process flows in different situations. In previous works, we have presented some collaborative patterns extracted from the modeling of many business processes related to a company operating in the ICT sector. These patterns have been aggregated to make a catalog of patterns. In this article, we want to present the experience of the adoption of the methodology and the catalog of patterns from some pattern designers of a company operating in Public Administration and Finance, with the aim of shaping an information system Enterprise 2.0, which takes into account the collaborative processes. The experience gained by users composing the test panel, will be assessed through an evaluation questionnaire. Finally, we will conduct an analysis of the obtained results, in order to improve the methodology and the catalog of the proposed pattern. The paper is structured as follows: the next section reports on key related work in the areas of analysis, description, identification and application of business practices, mainly to address knowledge workers' emerging needs. Section III provides readers with an overview of the methodological approach used to identify collaborative processes. Section IV describes the case studies where it was applied the methodology and pattern. Section V describes the investigation methodology used to evaluate the methodology and patterns. Section VI describes the results of the questionnaire administered to the users of the panel of the trial. Finally, Section VII summarizes our key messages and sketches future research directions.

2. RELATED WORK

Over the years, the concept of patterns has been applied in several fields. The idea was proposed by Christopher Alexander in his book *A pattern language* [4] where he scientifically describes an architectural system through 253 patterns that solve common problems of cities. The concept of patterns has been adopted and applied in the field of Software Engineering by the 'Gang of Four' in their famous book *Design Patterns: Elements of Reusable Object-Oriented Software* [5]. It has been applied in recent research in Business Process Management (www.workflowpattern.com) and other research works such as [6] that predict the proliferation of patterns for BPM. In [7] its use has described and evaluated workflow management technologies. Several methods in the identification of patterns have been proposed in the international scientific literature, such as bottom-up and top-down approaches [8], or a combination of these two [9]. Once identified, business process patterns have been used in different contexts for the re-design of the business process flow. An example is in [10] where the authors present business processes patterns in order to enhance the design of the public health care business process. Another example is in [11]

where the authors propose a methodology for business process re-design; the methodology consists of using the process context to discover the process nature and then applying the workflow patterns to the evaluating and enhancing of the current process in the given context. Another example is in [12] where the authors propose the development of a methodology for collaborative and ubiquitous learning; the methodology combines the advantages of a collaborative learning environment with the benefits of ubiquitous computing and flexibility of new digital technological devices. The previous works clarify the importance of business process patterns in order to design and re-design a business process flow made up of pre-defined activities assigned to specific stakeholders. The patterns, and in particular the collaboration patterns, still are helpful to designers. The concept of collaboration patterns has been introduced in the definition of virtual organization. A virtual organization is 'a temporary alliance of independent enterprises that come together to share skills, core competencies and resources in order to better respond to business opportunities, supporting cooperation through computer networks' [13]. The importance of such collaboration patterns in virtual organizations has been stressed in [14] where collaboration patterns were defined as a segments of work or parts of collaboration. The authors highlighted that the reuse of collaboration patterns can be an advantage in collaborative environments, such as virtual organizations, where there is an increasing need for modelling, executing, monitoring, and supporting the dynamic nature of collaborations. In [15] there is another work that proposes some collaboration patterns related to the virtual organization. These patterns are aggregations of detailed activities into larger-scale units. In that paper, the authors present a shared workspace system in order to collect and make available observations of a virtual organization. The real value of business patterns may be appreciated when it is possible to use the patterns in the design of business processes that describe the way of operation of the companies. Graphical models can be used to represent the patterns. An example of collaboration business process patterns is in [16] where the author describes guidelines for the development of business process models using BPMN 1.2. These guidelines focus on the use of the elements in order to correctly, consistently and clearly design artifacts, but do not focus on syntax and semantics. The importance of representing collaboration business processes, in general, and collaboration patterns, in particular, is shown by the introduction of BPMN 2.0 [17]. BPMN 2.0 contains several additional elements and new types of diagrams, especially to improve the modelling of processes that span several independent organizations. In particular, BPMN 2.0 introduces the collaboration diagram and the choreography diagram. In previous work [18][19][20][21], we presented a methodology and a catalog of patterns defined through the collaborative BPMN notation. In this paper, we evaluate the adoption of the methodology and the catalog of the patterns identified in previous work by some knowledge workers.

3. METHODOLOGY AND PATTERNS CATALOG

In this section, we will briefly present the methodology and the catalog of the patterns through a concept map, referring the details to the previous works.

3.1. Methodology

The approach to be followed to identify and apply the patterns of collaborative business processes is divided into six phases:

1. The first phase is characterized by the analysis of the business environment with much attention given to identifying some of the processes and areas that are characterized by both intense collaborative activities among the workers and the need to use Web 2.0 tools.

2. The work continues in the second phase: modelling the business processes detectable within the case used, selected in the previous step through the use of BPMN.
3. In the third step, the study and comparison of the BPMN diagrams of all the modelled processes starts; to identify new patterns, it is necessary to focus on all repetitive common and atomic “segments” which are in the modelling performed in the previous phase. Particular attention should be paid to collaborative and cooperative activities, where we found a number of practices that have considerable repetitiveness.
4. Some of the “repetitive segments” detected in the previous step may already be known, so at this stage, it is necessary to verify the existence of patterns similar or identical to the segments identified. In such a case, it is better to use the known solutions that have already been applied and validated in different contexts. Otherwise, these segments can be considered new, such as new patterns.
5. During the fifth phase, the design patterns identified in the third step start to be applied to model and realize a prototype of the collaborative information system. The purpose of this step is to verify the validity of the approach adopted in the identification of the patterns and to apply those patterns in the realization of a collaborative information system.
6. Following the experimentation, in order to verify the usefulness of the use of the patterns in the context of collaborative information systems, the data of the trial (sixth phase, evaluation of design patterns) needs to be collected.

3.2. Conceptual Map

From Figure 1 we have a comprehensive view of all the patterns, through a concept map from which emerge the functional dependencies that exist among the various patterns. The identified patterns respond, therefore, to two fundamental requirements: to manage the collaboration among different actors that are called to work to accomplish a given task without a pre-defined and a pre-structured sequence; to allow you to make the most of the typical tools of Web 2.0 within the enterprise. It should be noted that the identified patterns might be used in isolation or they can be appropriately concatenated each other to model specific situations.

4. APPLICATION OF METHODOLOGY AND PATTERNS: CASE STUDY

The methodology and patterns briefly described in the previous section were introduced into a company with information systems design experience. This had the goal of modeling and designing some processes related to Public Administration and Finance. In detail:

- Public Administration: "eGovernment Administrative Acts".
- Finance: "Circular 2.0".
- Finance: "New Banking Product".
- Finance: "Conclusion of contract".
- Finance: "Proposal for Funding".

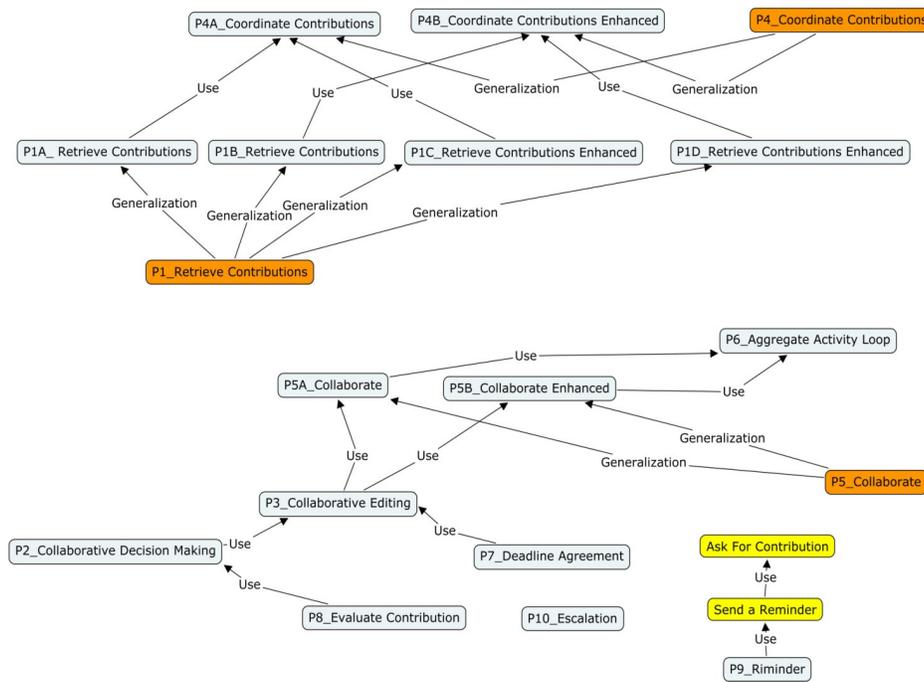


Figure 1. Conceptual Map

All these processes were modeled and subsequently re-engineered by adopting the methodology and the patterns catalog without applying to the latter substantial changes. The application of the patterns in the process of re-engineering has allowed the emergence of a series of activities that previously were not coded, but that were performed by operators.

The activity carried out has been divided into five phases:

1. Establishment of Focus Group with some employees of Links Management and Technology.
2. Discussion and study of the models resulting from the application of the methodology and of the catalog.
3. Formation of the designers on the patterns catalog, the methodology and the applicability of the latter to the contexts of reference.
4. Application of methodology and patterns to the study cases listed above from the panel of experimentation.
5. Evaluation of methodology and patterns and data collection by administering a questionnaire given to all the users of the panel of the trial.

5. INVESTIGATIVE METHODOLOGY

The criteria, which regroups the evidence and the critical issues identified, have been identified for analytical purposes. Therefore, we defined the dimensions of analysis used in the preparation of the evaluation questionnaire administered to users composing the panel of the trial. The questionnaire is divided into six distinct sections:

1. **Comprehensibility:** This section aims to assess the ease of identification of the operating rules that govern the methodology and logical paths used in the representation of collaborative patterns.
2. **Memorability:** This section aims to evaluate the simplicity and immediacy in the association of the patterns to the features that they should represent.
3. **Ease of Use:** This section aims to assess the ease of identification and association of the patterns in collaborative processes.
4. **Extensibility / Adaptability:** This section evaluates the preparation of the methodology to the introduction of new rules and new patterns and to adapting existing ones.
5. **Effectiveness:** This section is intended to evaluate the optimization of the modelling times of the business process obtained through the use and application of the methodology.
6. **Completeness:** This section evaluates the completeness in the domain of collaborative processes of the proposed patterns and of the methodology.

The questionnaire, that allowed the assessment of the following characteristics, consists of some open-ended questions, some yes / no, and many others based on a Likert scale. For each section, moreover, is present a free field called notes where users can express any idea and opinion. The choice of using the Likert scale is determined by the fact that through this scale it is possible to measure the attitudes and behaviors using a range of response options ranging from one extreme to the another (e.g. from not at all likely to extremely likely). Unlike a simple question "yes / no", a Likert scale offers the opportunity to discover the different degrees of judgment. This can be especially useful for delicate and difficult objects or subjects of investigation, as the one discussed in the following work. The number of response options helps also to more easily identify areas for improvement.

6. RESULT OF THE EXPERIMENT

In this chapter the results of the questionnaire administered to the users of the panel of the trial are presented in detail. The questionnaire was omitted for editorial limits. It was administered to four employees who hold the following business role:

1. Technical Innovation and Technology Leader Area.
2. Responsible for research.
3. Functional Analyst of the Innovation and Technology Area.
4. Functional Analyst of the Innovation and Technology Area.

As described previously, the questionnaire is divided into six distinct sections and each of them is composed of a series of questions. Almost all of the questions require an answer based on a Likert scale in four steps:

1. For Nothing (0.25 points).
2. Shortly (0.5 points).
3. Enough (0.75 points).

4. Much (1 point).

6.1. Comprehensibility

The results concerning the comprehensibility of the methodology and proposed patterns are explained in the following paragraph. The graph shown in Figure 2 illustrates in detail the results obtained by individual users for each of the sixteen questions provided in the questionnaire, in the section concerning the comprehensibility. The graph shows a good degree of intelligibility in almost all questions. An average rating of all questions is shown in the graph proposed in Figure, which shows that all users members of the panel of experimentation have found the methodology and the proposed pattern "enough" understandable.

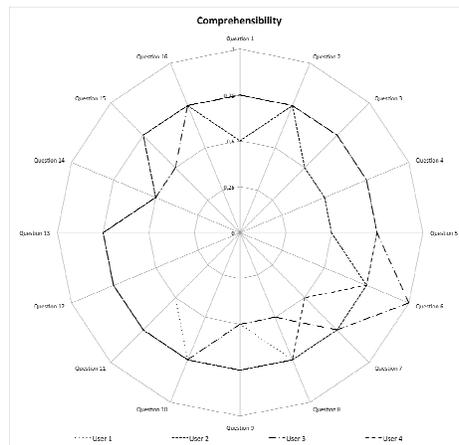


Figure 2. Comprehensibility for each user

Finally, from the observations made in the notes and the analysis of open-ended responses emerges that it is appropriate to equip all patterns with examples of applicability in order to improve the comprehensibility.

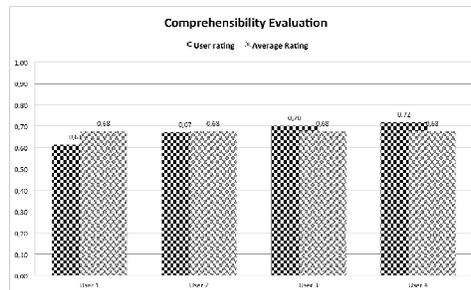


Figure 3. Comprehensibility evaluation

6.2. Storable

The following paragraph shows the results of the methodology and of the proposed pattern capability to store. The graph in Figure 4 shows a fluctuating trend with regard to the simplicity and immediacy to the respective pattern in the association of features that they must represent. This trend is justified by the different level of difficulty of storage for the various patterns.

An average rating provided by members of the panel testing is presented in the graph shown in Figure 5. This evaluation allows to state that the proposed methodology and some of the patterns are easy to memorize. Finally, it is clear from the observations made in the notes, that one of the key aspects that influenced the difficulty of storage is due to the nomenclature used in the catalog of patterns.

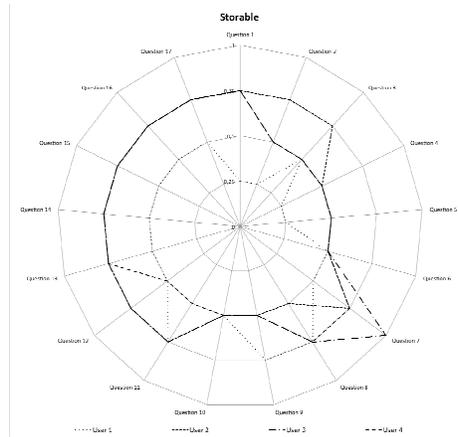


Figure 4. Storable for each user

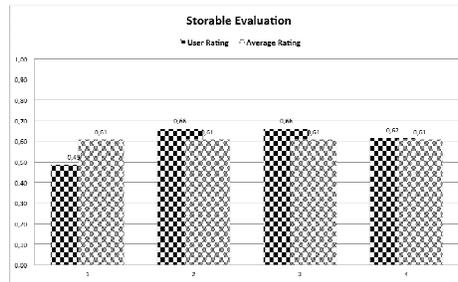


Figure 5. Storable evaluation

6.3. Ease of Use

The results regarding the ease of use of the methodology and of the proposed patterns are explained in the following paragraph. The graph in Figure 6 highlights an excellent ease of use by three out of four users.

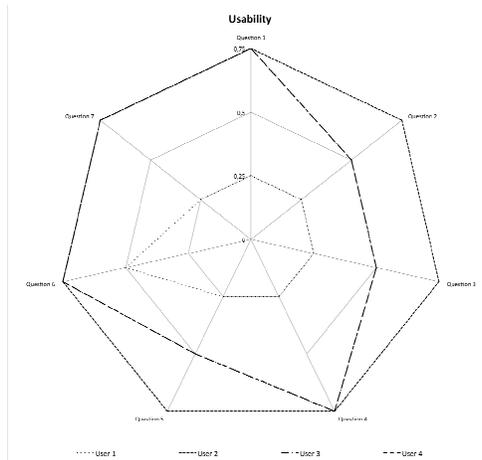


Figure 6. Usability for each user

The graph in Figure 7, puts more light that only one user (User 1) has encountered some difficulties in the use of pattern, justifying notes that this difficulty is due to the ambiguity of some of them. The rest of the users has expressed a very high degree of usability by ensuring a sufficient level average.

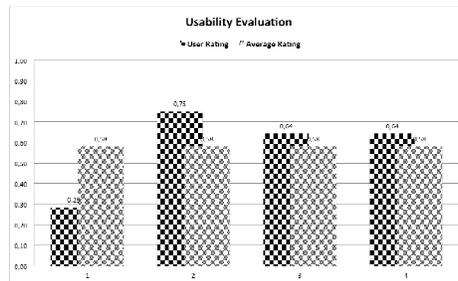


Figure 7. Usability evaluation

6.4. Extensibility/Adaptability

The following paragraph illustrates the results concerning the extensibility and adaptability of the proposed methodology and patterns. The graph in this Figure 8 shows in detail the results obtained by individual users for each of the questions given in the questionnaire, in the section on the ease of use. From the graph, it is seen easily that for the majority of users there is a good preparation of the methodology to the introduction of new rules and new patterns or to the adaption of the existing ones.

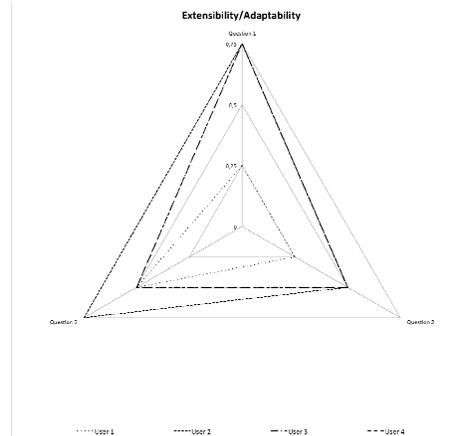


Figure 8. Extensibility / Adaptability for each user

Even in this case, the graph shown in Figure 9 puts the attention that only one user (User 1) has encountered difficulties in extending and adapting certain patterns. The rest of the users expressed a sufficient degree of adaptability-extensibility ensuring, therefore, a nearly enough average. However, from the observations made in the notes and from the analysis of the open-ended responses, it emerges that it is advisable to increase the level of generality of the pattern in order to improve the adaptability and the extensibility.

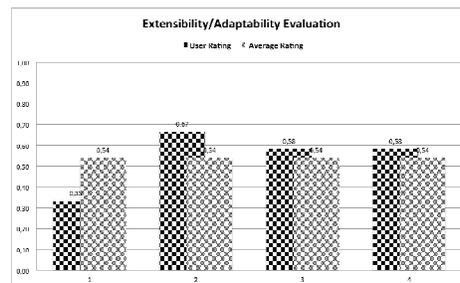


Figure 9. Extensibility / Adaptability evaluation

6.5. Effectiveness

The following section summarizes the results regarding the efficacy of the methodology and of the proposed patterns. Differently from the previous sections, in this case it was not possible to give many details about the results using diagrams, because of the very few questions with response based on Likert scale. Almost all of the questions in this section are open questions. However, it is clear from the responses received that there was a big difficulty in assessing the effectiveness due to the lack of meaningful metrics.

6.6. Completeness

The results concerning the completeness of the methodology and of the proposed patterns are explained in the following paragraph. In addition, in this case it was not possible to detail the results by using the diagram, due to the very few questions with response based on Likert scale. However, from the observations made in the notes and from the analysis of open-ended responses, it is clear that the proposed methodology is "a little" complete for the users of the panel

of experimentation. This result is justified by the fact that the methodology and patterns are still in their infancy.

7. CONCLUSIONS AND FUTURE WORKS

This document has been dealt with the analysis and testing of the methodology and of the proposed catalog of patterns concerning the modeling of processes that involve collaborative practices according to the paradigms of Enterprise 2.0. The proposed catalog has been accepted by the designers who have adopted it fully and without substantial changes.

It has been defined a survey methodology suited to identify the applicability of methodological guidelines and to report cases of corrections or improvements.

For analytical purposes, the criteria have been identified which regroups the evidence and the critical issues identified. It has been defined the dimensions of analysis used in the preparation of the evaluation questionnaire administered to members of the trial panel members. In summary, the results obtained in the six sections object of the study are:

- A good level of comprehensibility of the methodology, which can be improved by providing practical examples of application in the definition of Collaborative patterns.
- From the point of view of the ability to store, it can be enhanced by defining a nomenclature more simple and intuitive.
- Ease of use is good.
- There is a good extensibility / adaptability.
- The effectiveness is little measurable without the presence of meaningful metrics.
- The methodology has to be completed by acting on the generalization of the pattern.

As future work, we expect the adoption of the changes required, in particular on the comprehensibility and on the capability to store, on the application of the catalog in other contexts and on the implementation of the latter on different BPMS workflow systems. For example, workflow systems that work in cloud computing as described in [22].

ACKNOWLEDGEMENTS

This research has been partially supported within the research project D@Work 2.0 (Documentation at Work 2.0), by the Italian Ministry of Economic Development (MISE), with the funding initiative "Fondo per l'Innovazione Tecnologica (F.I.T.) istituito dall'art.14 della legge 46/82", and by Links Management and Technology S.p.a., which is the project leader.

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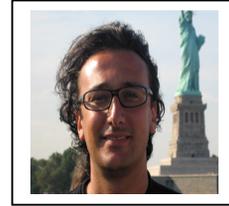
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