

Towards an Assessment Method for Social Transparency in Enterprise Information Systems

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Abstract—Social transparency through an enterprise information system refers to the use of digital media by individuals and groups to communicate their own information voluntarily to others within their work environment. It is typically meant to support positive work ethics such as collaboration, trust, efficiency and informed decision-making. Unmanaged social transparency may lead to negative consequences such as information overload, motivating unwanted grouping amongst colleagues and leading to an increased pressure to perform in a certain manner. There is a lack of systematic methods to evaluate and assess the quality of social transparency in general and its shortcomings and risks in particular. Our research aims to provide engineering methods for social transparency platforms as a domain-specific social computing service that can shepherd interactions and analyse content and detect and correct anomalies. As a first step, we conducted a multistage qualitative study, including focus groups and in-depth interviews to explore and conceptualise online social transparency and the risks stemming from its unmanaged implementation. We provide a reference model as a starting point for methods to assess social transparency risks. Our conceptualisation and reference model are based on a goal-oriented requirement engineering (GORE) mindset mainly because transparency and its effects are closely related to intentions, tasks, resources, strategies, and interdependencies between organisational actors; all of which are common constructs in GORE.

Keywords—Transparency, Online Social Transparency, Organisational Information Systems, Requirement Engineering, Conceptual Modelling

I. INTRODUCTION

In enterprises, staff can reveal information about themselves and their activities through online platforms. For example, enterprise applications allow employees to communicate real-time information about their activity streams, assigned goals, work priorities, work progress and work done jointly with others [1]. Transparency amongst enterprise’s members aims to improve productivity, saving time and promoting collaboration. Online transparency is increasing rapidly and leading to changes in staff behaviour when conducting work and interacting with others.

In this work, we focus on social transparency within an organisation. We define social transparency as:

The voluntarily use of online platforms by the members of an organisation to share their own information with other member. This voluntary sharing is typically to enhance situation awareness, coordination and collaboration quality. Examples of information shared include task priorities, workload, social interdependencies, current activities, level of skills and level of interest in certain tasks and objectives.

Transparency is often cited in the literature as one of the organisational regulations to enhance organisation-stakeholder relationships. It has often been researched from social viewpoints as a solution to maintain organisational ethics and reduce misdeeds [2], building or rebuilding organisational trust [3] and employee engagement and motivation [4]. Its online version and its associated risks are still under-researched. Most enterprise information systems come with social networking services in them, and this provides a chance to implement social transparency. Methods on enabling it so that risks are mitigated are still lacking.

From an organisational behaviour perspective, providing transparency as a service in enterprise applications is conceptualised as “understanding other’s intention and goals”, “being informed,” and “freely volunteering information”[5]. Organisations adopted social transparency as a core value and embedded it in their culture and style of internal communications to improve relations between internal actors and to motivate engagement in a job which then leads to performance improvements [6]. There are a few research have conceptualised and studied social transparency in enterprise information systems. Erickson and Kellogg [7] argued that social transparency between co-workers, and making them aware when someone involved in a joint project, would encourage participation and promote collaborative work. There is also a considerable amount of research on awareness systems designed for specific functions such as tracking the activities of a group on a shared artefact [8, 9]. Carl and Saul [10] argued that knowledge about where others are working and what they are doing is useful for collaboration, coordinating actions, anticipating others’ actions and finding opportunities to assist one another. Therefore, they developed a framework to aid groupware design.

Despite the positive connotations, the incomplete or limited fashion of implementing social transparency in organisational information systems has potential side-effects. For example, a high level of real-time transparency between team members can lead to risks of information misuse, undesirable staff groupings, stressful competitions and information overload [11]. The negative impact of transparency in organisational information systems mainly stems from its usage or perceived usage as a performance tracking mechanism as well as a pressure mechanism to increase work quality and productivity. Transparency can be used to assess and motivate individuals through self- and peer- comparison based on monitoring their status, activities and performance in terms of quantity and quality. However,

tracking performance and peer comparison can increase the perception of transparency as an exploitation mechanism [12]. Pressure stems from a feeling of being watched and monitored by other parties in the workplace, although the information itself may not necessarily be private. This includes visibility of recent activities and the pace of progress to all members of the organisation. While the quality of transparency and the impact of its limited and flawed implementation were recognised in the information systems literature [13, 14], there is still a limitation in providing conceptualisations and systematic methods to help assess it systematically and against clear metrics.

In the requirements engineering literature, several studies have been conducted to assess and evaluate the concept of transparency. An argumentation framework was proposed as a formal approach to capture transparency-related requirements in [15]. The authors in [14] handled the problem of software transparency using the idea of requirements that need to be understandable and readable for both general stakeholders and software developers. Hence, they proposed a transparency measure that represents a substantial step towards achieving useful transparency. In [16], a survey was designed to find an effective and efficient way to measure and control the level of transparency in software development processes. In [14], transparency was treated as a quality requirement for software systems and, therefore, soft-goal interdependency graphs were used to conceptualise transparency and the several quality requirements related to it. In [17], the need for evaluating and assessing transparency was the driver for producing four reference models designed to act as foundations for methods which manage transparency so that information is delivered and presented in a meaningful and useful way to the appropriate audience. The authors in [13, 18] proposed TranspLan as a modelling language to capture transparency requirements in business information systems. They designed models and templates to identify transparency requirements within organisations and proposed algorithms to reason the consistency and conflicts in the captured requirements.

In this paper, we advocate the need for systematic methods to conceptualise and assess online social transparency. We identify its coverage of relevant and necessary content, the quality of presentation and timing, and the sources that contribute to the occurrence of issues its configurations may present. We provide empirical evidence that online social transparency is associated with risks and needs conceptualisation and more formal presentation so that it can be assessed and diagnosed. We conceptualise the main factors that can lead to transparency limitations and adverse effects in the workplace. Our analysis is based on goal-oriented requirements engineering (GORE) mindset [19]. This is because transparency is mainly about personal status, intentions, goals, plans, tasks and social inter-dependencies, all of which are essential constructs of this paradigm in information systems analysis and design methods. Finally,

we provide various requirements that must be considered in conducting the assessment process of online social transparency among organisational actors.

II. RESEARCH METHOD

The literature lacks systematic approaches that specifically evaluate the level of transparency as well as its quality and associated risks in enterprise information systems. Therefore, we set out to explore what these aspects are in the first place. As a starting point to developing such approaches, we conduct a qualitative study to explore transparency requirements in terms of information content and quality, as well as the risks of certain modalities of applying transparency in the workplace. Our exploration was also informed by studies which suggested how to make transparency useful in general; e.g. the timing, level of information, level of details, and type of inter-relations between actors where transparency takes place [20]. For assessing transparency implementation faults, in particular, another range of transparency factors became primary; e.g. activities, priorities, skills, preferences and abilities, as demonstrated later in this paper.

A. Data collection

A multistage qualitative study was used to investigate the requirements and potential shortcomings of applying transparency within organisational information systems. We used multiple data collection methods including (i) literature review to prepare the exploration study (ii) focus groups for exploration purposes and (iii) in-depth interviews for refinement and further investigations, to increase the diversity, granularity and credibility of the results. Table 1 summarises our method.

a) Focus groups phase

A total of 14 individuals participated in two focus group sessions to explore how they view online transparency in the workplace, their requirements of it, and how certain modalities and configurations of transparency contribute to risks that affect aspects of their work environment. We recruited participants who worked in organisations where

TABLE 1. RESEARCH METHOD STAGES

1 st Phase		2 nd Phase
Foundations	Exploration	Refinement
Literature Review	Focus groups	Interviews
- Review of the literature e.g. in organisational transparency, situational awareness, CSCW, group dynamics, organisational culture, trust and openness.	Two scenario-based sessions - Eight participants from various organisational roles and affiliations. - Six participants from various academic background (Informatics, Management and Psychology)	Semi-structured interviews with fifteen participants: - Ten employees from different workplaces e.g. universities, call centres and banks. - Five professionals from managerial roles which they are Project Manager, Call Centre Manager, Team Leader and two Supervisors
Literature is presented in section I	The results are presented in section IV	The results are presented in section V

their role involved collaborative work with others online. At the beginning of the session, the participants were given a presentation to familiarise themselves with the context of the research. We developed four scenarios to cover various aspects of transparency such as its content (e.g. intentions, plans and status), its presentation (media and interfaces), its timing and relevance. We used them in the session to stimulate discussions. Each scenario included questions to be answered individually before discussing it within the group.

b) Interviewing phase

The findings from the focus group study were used as a foundation for further investigation. We conducted an interview study to (i) confirm and refine the findings that related to the transparency assessment factors resulting from the focus group and (ii) explore families of typical risks related to unmanaged online transparency stemming from those factors. While we used scenarios in the focus group study, the interviews were intended to delve into the personal experiences of the participants about online transparency in their workplaces. The use of scenarios in the first study was meant to provide a starting point while the interviews allowed us to elaborate and refine them in-depth. The interviews phase sought to explore the risk of transparency through the professionals' lived experiences and different work environments. We interviewed 15 participants throughout two stages. We first interviewed participants from diverse work environments, including academia, small companies and call centres. Ten employees agreed to participate in this study (four females and six males) aged between 27 and 43 years. In the second stage, we interviewed professionals in managerial roles. Five managers from various levels of seniority participated in this study that they are a project manager, call centre manager, team leader and two supervisors. Diversity in gender was also considered in the second stage, with two females and three males aged between 36 to 52 years. The interview followed a semi-structured approach so that we could also expand into new aspects considered by the participants in this and previous stage to be important additions to the focus group results and our set of questions. The second stage allowed us also to get the management perspective of transparency concerns raised by the employee in the first stage.

B. Data Analysis

The focus groups and interviews were transcribed verbatim to support further analysis. We used a thematic analysis approach by coding the content and grouping the codes into themes [21]. In the analysis stage, we identified the participants' views on their transparency expectations from their co-workers and managers and their concerns about affecting their role, social dependencies and actions. We used the findings of the focus group as a template to start with when analysing the interviews data and expanded it until we reached the saturation point in both stages, i.e. after we interviewed ten employees and five managers.

III. ASSESSING ONLINE TRANSPARENCY: FOUR ESSENTIAL FACTORS

From the analysis of the focus groups, we identified essential factors for the assessment of transparency amongst the social actors of an enterprise. The remainder of this section elaborates on these factors.

A. Transparency recipients

Social actors in the enterprise information systems may communicate their own information online and on a voluntary basis. Information recipients have various social and work dependencies with the provider and they come from different ethnographies, skills, interest, practical background and experience. We found in our study that the first factor that should be considered in assessing transparency is the differences amongst the recipients which relate to practical and cognitive accessibility to the communicated information. One participant stressed that "*in order to avoid ethical issues in the workplace, transparency should reach to the right member*". We found that transparency must be customised based on the role of the recipients and their dependency relationship with the provider. For example, a project manager required transparency about the overall progress of the team while a team leader required transparency about tasks priorities and task interest in order to coordinate the overall performance. Moreover, we found that the information provider has to consider individual differences such as goals, tasks and skills, background, experience, interest in these goals and tasks. The diversity amongst recipients will also be essential in assessing the other three factors, *content*, *presentation* and *timeliness*.

B. Transparency content

Content is a key aspect of transparency processes. Enterprises use transparency as a kind of information sharing approach to raising awareness of the factors that explain individual and team situations, processes, resources, rationales and decisions with the aim of informing the decisions made by others. Work on situational awareness states that "notifying members of actions on shared artefacts helps them maintain mental models of others' activities and avoid potential coordination conflicts" [22]. A participant in our study stressed that "*implementing transparency is not enough to improve the quality of the work but the information that is revealed to colleagues who plays an effective role in the improvement process*". We found that the visibility of social and work information such as employee goals and tasks in terms of activeness, degree of interest and skills in performing them, their priorities, and dependencies needed to achieve them are all important elements in the assessment of online transparency in organisational information systems.

C. Transparency presentation

The quality of information presentation refers to the extent to which information is understandable and readable by the intended audience [23]. It is one of the main challenges of communication within enterprises. In the focus groups, it was emphasised that organisational staff might come from different backgrounds, locations and education levels and have various cognitive abilities and preferences. Such diversity highlights the importance of presenting information in an interpretable, easy to understand, consistent and compatible format to the recipients. Some participants emphasised that “*transparency should produce information that is compatible with the recipient’s cognitive skills and context*”. Other factors such as workload and interest can also be considered when tailoring the presentation of transparency information.

D. Transparency timeliness

Transparency can be effective if the information communicated is timed in a way that enables the recipients to take a decision and bring about positive outcomes. Based on [24], the timeliness of information refers to the extent to which the information is sufficiently up-to-date for the task at hand. One participant commented that “*providing information must be in a timely manner which enables actors to plan their activities*” and that untimely information are “*distractive*” and “*noise*”. Our analysis of the participants’ point of views revealed that timeliness of transparency must be consistent with the activeness and duration of the actor’s goals and tasks. For example, providing information to actors regarding their inactive tasks seems to be early to make a decision and might result in creating information overload. We also found that our participants prefer to receive information about their short term tasks more than the long term tasks. They explained that as the time of the short term tasks is limited, and late sharing of information loses its value to that task.

IV. ASSESSING ONLINE SOCIAL TRANSPARENCY: A REFERENCE MODEL

In this section, we propose a reference model (Fig. 1) that is meant to be a starting point for the enterprise online transparency assessment methods. The assessment goal would be to analyse whether transparency is implemented in a way that makes relevant information available in a timely fashion to the right recipients with minimum diverse effects on other members in the enterprise.

The identification of transparency goals is the main step in the assessment method to manage the level of transparency about the content, time, presentation and intended recipients. One participant emphasised the importance of identifying the transparency goal as “*by determining the goal behind disclosing information in the staff profile, are they trying to project identity then they may do that through the interest they list or the achievement they have done? However, if they identify task and priority, then transparency will be more task-based*”.

We found that transparency can be practised as a business goal to improve the quality of work. From analysing the interviews, we recognised six types of transparency goals: Productivity, Promoting, Collaboration, Learning, Awareness and Relationship. These six goals of transparency are owned by stakeholders who are individual or groups. Due to the page limitation imposed on this paper, we have not elaborated these goals. The association between classic non-online transparency and these goals is elaborated in the literature [12, 25, 26] and was reiterated by the participants about online transparency. One participant commented that “*transparency about individual skills and interests could help to raise interest in collaboration*”. Another participant stated that “*transparency amongst two teams about their progress or the way tasks are prioritised may raise awareness on how to work in parallel*”. Hence goals of transparency seem to be largely similar regardless whether it is implemented offline or online.

While some reference models were proposed to manage transparency in information systems [17], risk factors and risks were not the focus. We elaborate on the assessment part in the following.

A. The goals of assessing transparency

We found that enterprises assess transparency to tackle certain issues and to provide opportunities. The reference model presents three needs of transparency assessment in the enterprise information systems.

- **Improve the quality of transparency implementation**

Transparency is implemented in order to enhance the openness culture amongst enterprise actors and create a harmoniousness workplace. However, random and weak implementation of transparency erodes its ability to support workplace harmony and create an opportunity to raise issues such as information leakage, information overload and privacy violation.

- **Minimise threats of transparency**

Various transparency threats relate to actors’ intentions, goals and tasks. For example, transparency about real-time performance data can be seen as unwanted pressure and threats for people who prefer to schedule their tasks their own way. Other transparency threats result from a lack of transparency about an actor’s work-related boundaries. Enterprises need to assess the level of transparency to avoid potential threats such as corruption, stressful competition and low productivity. We reiterate here that our work is focused on voluntary transparency and not that enshrined by the job contract.

- **Take opportunities**

Enterprises use transparency to support and enhance various opportunities to improve the quality of work, reputation and consumers trust. An example of opportunities in the workplace is enhancing collaboration amongst social actors. One of the participants stated that they select others to collaborate within a task based on the visible information

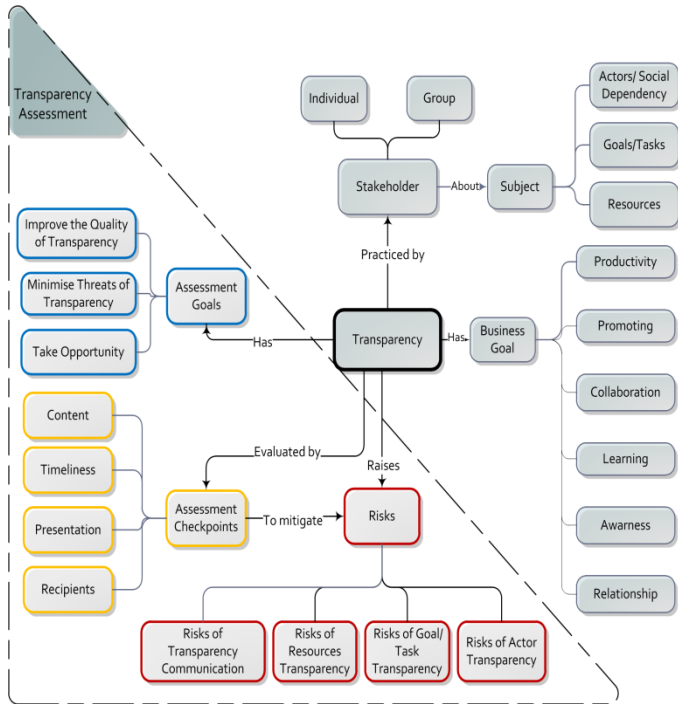


Figure.1. Reference Model for Assessing Social Transparency and its Risks

about those acquaintances' abilities in similar tasks. One of the examples in the interview revealed that a junior developer was recruited by a project manager after a voluntary declaration of his history of activities and time have taken to accomplish them. Transparency also provides an opportunity to learn from work acquaintances. For example, transparency regarding activities designed to achieve goals was seen as a learning resource by the participants. Transparency can also foster social learning within the enterprise, which relates to attitude and behaviour [27].

B. The risk of transparency

We found that limitations and flaws in the quality of online transparency as a content and delivery method can lead to side-effects. The identification of risk factors is an important step in the design of the assessment method to manage the level of transparency. As previously mentioned, our analysis was based on goal modelling which is used for sociotechnical systems analysis and design. Therefore, we recognised four categories of risk factors that are related to the provision of information for actors about goals, tasks and resources, as shown in Fig.1. In the following section, we list both (i) risk factors and (ii) exemplar risks (written in *italics* and underlined text).

a) Actor related risk factors

In an enterprise information system, actors are defined as active and autonomous entities that aim to achieve their goals by collaborating with other actors [28]. They may be human, organisational or technological entities. Our analysis was focused on the transparency between human entities as

individuals or groups. Transparency through online platforms, such as ESS in a collaborative workplace, allow actors to disclose information about their names, gender, age, skills, experience and achievements and also how they perform in certain tasks. While it usually aims to enhance the relationship between actors; we found that this could pose the following risk factors that may lead to diverse effects in their wellbeing, relationship and performance.

Actor performance factor: Online transparency of actor performance, e.g. using a progress bar to show the progress made in certain tasks, may have diverse effects on the level of collaboration between actors. Progress in some tasks depends on the length of their practical experience and knowledge background. Comparing staff performance can result from unmanaged transparency. In a collaborative workplace, transparency regarding performance may create comparisons with highly qualified staff and can result in tension and lower self-esteem among less productive employees. Online transparency such as transparency in ESS can be accessed by different actors in the enterprise, which may cause a conflict of interest. For example, a member of a team may share difficulties regarding doing certain tasks to seek help, but other members may use this information to report to the team leader about his/her performance. It also has a high possibility of causing counterproductive competition and malevolence amongst actors who have the same level of experience and background, which in turn affects their productivity. Moreover, there is a risk of creating pressure as a result of displaying an actor's performance to all members in the workplace. For example, one of the participants mentioned that their company uses screens in each department for monitoring purposes of tracking staff performance in their assigned tasks. However, using these screens create pressure on the staff because they feel monitored by all members of the department.

Actor demographics factor: as previously mentioned that the enterprise social software is one of the online platforms that are used to implement transparency in enterprises, applying transparency in organisational information systems may allow staff to share information about their profile (e.g. name, gender, age, and personal image), interests, skills, capabilities and background in relation to certain goals and tasks. Sharing personal information may cluster people in symmetric groups. Joining a group of people who share the same interests, level of ability and skill can be seen as an advantage to the workplace. However, the risk of creating an unfair workplace environment by isolating certain staff can reduce individuals' productivity and increase employee turnover. Staff with the lowest level of skill or the least knowledge in certain tasks may leave the organisation if they do not benefit from highly qualified staff.

b) Goal/task-related risk factors

Based on GORE model [28], goals represent a work-related state that is sought to be achieved, and tasks represent an activity that executed to attain certain goals.

Goal and tasks are delineated by actor boundaries and fulfilled in collaboration with other actors through dependencies. In some enterprise social software, actors are transparent about their goals and tasks but not the intention to attain them. Due to the similarity of the goal and task intentions, our analysis revealed crosscutting factors related to actors' intentions to attain their goals and tasks. However, we found that transparency in relation to these factors can result in certain risks arising.

Goal/task status factor: We defined status as a property that indicates the current condition of the goal or task at hand. Status shows whether a goal or task is active or inactive for other actors. Online organisational platforms provide an opportunity to share the status of the goal and the task to encourage collaboration amongst actors. However, we found that risks of associated with *lack of collaboration* can stem from a lack of transparency about the activeness of the goals or the task. We also found that a lack of transparency about current task status may increase the level of uncertainty and cause an *undesired disturbance* in the workplace. In the context of collaborative goals and tasks, we found that unawareness of the status may create *stress* for actors who depend on these goals or tasks. Similarly, transparency about goal and task status has a high probability of increasing risks in collaborative workplaces. Excessive transparency about the active goals can create *stress* and adversely affect the quality of performance because it can *pressure* collaborators to furnish the required resources and synchronise tasks with others according to their own timing. We found that transparency of task status with actors who depend on the outcome of another task may cause a risk of *delegation responsibility* to other members. For example, a team leader depends on a member to write a report, but that member shared that the currently active task involves designing a prototype, the leader delegates the report, thereby adding to the workload of another member.

Goal/task priority factor: One of the main reasons for ethical and wellbeing issues in the organisational information systems is the conflict between employee interests and plans [29]. In organisations, *conflict of goals and tasks* can occur as a result of a lack of transparency about their priorities. For example, a mechanical engineer may be working on two different projects with two different teams. Both teams have different priorities for their goals, but they do not share this priority with the engineer, and they expect the engineer to dedicate all his time to their work. This may create a conflict of goals because the engineer is not aware of the goal priority and he/she may spend more time on one goal than the other. A participant stated that *"the priority of the short term and active goals are higher in the workplace to ensure the acceleration of progress"*. However, a lack of transparency about priority amongst organisational actors can risk a *lack of engagement* and *loss of interest*, which in turn negatively affects overall performance and the achievement of the organisational goal. Similarly, transparency of goal priority also gives rise to the

risk of *misunderstanding* and *disappointment* among peers who collaborate on the same goal. For example, if a project leader assigns a high priority to individual goals and makes it visible to the project team then it may create *stress* for team members who have collaborative goals with that leader. It may also make them *less committed* to the project.

Goal/task duration factor: Goals and tasks in organisations can be classified based on the order and duration needed to achieve them into short-term and long-term. A lack of transparency regarding the duration of the goal may adversely affect the collaboration between peers. Collaboration between peers can happen voluntarily to accelerate progress. On the one hand, there is a risk of *conflict arising between goals and tasks* due to a lack of awareness regarding their durations. A participant stated that *"I prefer to be informed about the time needed for each goal to avoid a conflict situation where two goals need to be finished at the same time"*. On the other hand, transparency about the duration of a goal may risk a *loss of interest* in contributing to long-term goals because some people feel motivated and committed to short-term goals.

Goal/task dependency factor: An actor's goals and tasks are fulfilled in collaboration with other actors through dependencies. A dependency is a relationship amongst two actors: a depender who relies on a second actor referred to as dependee for the accomplishment of certain tasks [28]. Dependency may be established at the level of actors (one actor depends on another) or at the goal/ task level (a goal depends on another goal) [28]. Online enterprise tools are able to display goals and tasks but unable to display the identity of actors in dependency relationships. A lack of transparency creates unawareness about the identity of the depender or dependee, which in turn adversely affects the actors' wellbeing and performance. Unawareness about the depender's identity may cause a risk of *reduced commitment* to the assigned goal. For example, a project manager depends on the team leader to increase team productivity. A lack of transparency among team members regarding the identity of the depender (project manager in this case) leads to a lack of commitment to the goal. Similarly, a lack of transparency about the dependee's identity has the potential to create *misjudgement* and *unfair comparison*. For example, a delay can occur if members of a team depend on outcomes from other members. A team leader may misjudge the delay in their performance if they are not transparent about that dependency.

Goal/task interest factor: The interest in a goal or a task seems to be an important predictor of actual performance [30], interest is associated with focused attention, cognitive functioning and persistence [31]. However, our investigation found a negative effect of transparency of goal and task interest on co-worker performance. In a collaborative environment, we found that a lack of transparency about interest in achieving a goal or performing a task may have a negative impact on other members' interest in collaborating or providing assistance.

This may increase the risk of a *lack of engagement* and *loss of interest* between co-workers which may adversely affect the achievement of organisational goals. Similarly, transparency about the level of interest in certain goals and tasks may help to stem risks in the workplace. Our study found that risk of *social loafing* whereby team members reduce their effort and rely on others to perform a task may appear as a result of sharing a high level of interest in certain tasks with other team members. In a collaborative task or goal, we found that sharing less interest in shared tasks may result in *reducing the level of commitment* of partners in that task.

Goal/task progress factor: In online transparency, progress can be presented as the status of the achievement (e.g. in progress, partially completed, fully completed) or as a percentage of the achieved work (e.g. 70% completed). We found that a lack of transparency about a goal or task progress has negative effects on the wellbeing of actors, especially between actors who depend on each other. This may increase the level of *stress* among actors who depend on this goal or task. One participant stated that *“if a member of the development team depends on the testing team to provide a defect report. The development team may experience stress if the testing team is not transparent about their progress”*. We also found that using a progress bar in a collaborative tool in ESS may create *unproductive competition* as members try to set their performance based on other performance rather than the team goal. There is also a risk of *unfair comparison* if progress is shared with the team leader. Transparency about reasons for limited progress may help to avoid such risks.

c) Resource related risk factors

A resource is a physical or informational entity that is owned and provided by actors [28]. Transparency about such resources increases awareness in the workplace and improves overall performance. However, the effectiveness of transparency is affected by factors related to these resources such as availability, ownership and accessibility. In the following section, we present the risks and the factors that relate to the resources used in online transparency.

Availability factor: Risks amongst actors can stem from a lack of transparency about resource availability. A lack of transparency about resources makes actors unaware of the status of the resources between them [25] and diversely affects actors' expectations and their overall performance. A lack of transparency about the availability of physical resources may lead to the risk of a *lack of engagement* in certain tasks. One participant commented that *“companies may advertise for a certain task to encourage employees to engage but a lack of transparency about the availability and sufficiency of the needed resources such as software may adversely affect employees' engagement”*. Moreover, we found that the risk of *resource conflict* can result from a lack of transparency about resource availability because resources may be allocated to various activities' schedules at the same time. In terms of informational resources, risk

such as a *lack of commitment* may occur from a lack of transparency about information related to actors' goals or tasks. For example, team members depend on the project manager to provide information about project updates and progress. A lack of transparency about the project may reduce actors' commitment to the project plan. *Stress* and *pressure* are other risks that may result from the unavailability of information about a project's progress.

Ownership factor: Jarvenpaa and Sandy[32] found that actors who are associated with resources and who have worked on resources or whose identity is tied to the resources are all seen as having ownership of the resources. Actors have self-ownership when they are the only owner of the resource, such as personal documents whereas they have collective ownership when they own shared resources with other actors such as reports of a team's progress. We found that an ethical issue such as *privacy violation* can be raised as a result of transparency about collective resources. For example, a report of teamwork is a collective resource that includes information about the progress of team members. A participant stated that transparency about peers' resources may have an adverse impact on their wellbeing because this information can be used for *intimidation* and *abuse* purposes if it reaches an improper person.

Accessibility factor: The results of our analysis revealed that transparency about the identity of actors who access a certain resource affects the wellbeing of actors who use that resource. For example, declaring that the project manager can access the team discussion in enterprise social software may increase the level of *stress* and *pressure* on the team members. We also found that transparency about this kind of information creates *counterproductive competition* amongst team members because each member sought to create a good impression of their performance.

Status factor: This factor represents the condition of the used resource. In a dependency relationship, a lack of transparency about the status of the resource may result in a *misjudgement* about the actors' performance. One participant stated that *“Transparency about the old version of the used software made the manager aware of the reasons that hindered the team's progress”*.

Sufficiency factor: One of the main problems facing actors while working is insufficient human resources and physical resources. In our study, we found that a lack of transparency about the sufficiency of resources may lead to a *lack of engagement and collaboration* in certain tasks. One of the participants in our study was invited by his manager to collaborate in a project, but he did not engage due to a lack of awareness about the number of people in the project.

Outsourcing factor: This occurs when one actor contracts with an external actor to provide resources about a certain task or goal. Outsourcing is one of the main risks that affect employee wellbeing and performance. For example, a risk of *reduced trust and employee displacement* may occur due to transparency about outsourcing with external actors. Also, transparency about outsourcing to provide resources

may increase the risk of *extortion* if the outsourcing is seen as abnormal and misaligned with the enterprise's culture and norms.

Value factor: Resource value represents the importance of the resource to the actor who owns and depends on that resource. The importance of the resource relates to its economic or functional value. We found that a *lack of commitment* to provide certain resources, such as a technical report, may result from a lack of transparency about the functional importance of the resource to the requester. Moreover, *progress* may be delayed as a result of a lack of transparency about the resource's importance.

d) *Transparency communication-related risks*

Our focus group study revealed the importance of assessing transparency communication as a cross-cutting aspect to the content, presentation, timeliness and recipients. In this section, we elaborate on this aspect using the interview study and reveal risk factors and risks related to transparency communication.

Relevance factor: It is defined as "the extent to which information is applicable and helpful for the task at hand" [33]. Information is relevant when it is appropriate to the user's expectations [34]. Irrelevant transparency amongst organisational staff may hurt the level and quality of collaboration between them. Moreover, information may cause *information overload* for the recipient if it is out of date or inconsistent with the recipient's needs.

Moreover, the sender may be *abused* if the information is accessed by an improper person. We also found that transparency of irrelevant information increases the level of *distraction* and *disturbance* in the workplace. Therefore, customising the content of transparency can deter the occurrence of potential associated risks. For this reason, the level of transparency can be evaluated within the context of the goals and tasks of recipients such as location and task type.

Representation factor: This aspect emphasises the importance of presenting the information in an interpretable, easy to understand and compatible format to the recipients. Risks such as *loss of interest to collaborate* occur as a result of receiving difficult to understand information or a high volume of information. For example, when a member of the development team shares low-level technical issues with a project manager, this information may not be understandable and the manager could become less motivated to take supportive action. Moreover, a high volume of information may result in a *reduced speed of performance* because it is time-consuming and takes longer to make a decision. While transparency is used to enhance staff motivation, there is a risk of being *less motivated* due to the incompatible format of the shared information. For staff to be motivated, transparency processes should produce information that is compatible with their cognitive skills and context. In other words, the presentation of transparency shall differ based on the ability of staff to process information for their own purposes.

Timeliness factor: Timeliness of transparency is an important dimension for improving staff performance because information reaches the recipients when they are ready and able to make a decision. However, potential risks of a *delay in progress* and *low performance* may occur as a result of late and the untimely sharing of information. An untimely manner of transparency can also lead to high levels of *stress and pressure in the workplace*. As we mentioned before that delays in completing a task due to a lack of timely transparency could explain increased levels of stress and pressure. Delays occur due to the time required for information processing and making decisions and the untimely transparency among decision-makers. For example, declaring that actor will be going on holiday after several days shall be timely in the sense of this being shown automatically to colleagues when trying to email the actor so that they do not expect their request to be actioned and they may decide to cancel.

C. *The assessment checkpoints of transparency*

In the previous section, we present various kinds of risks that emerge in enterprise information systems as a result of unmanaged online transparency. However, we found that these risks might be mitigated by evaluating and assessing the level of transparency amongst actors. In the following section, we suggest four types of assessment checkpoints that we will use (as the next step in this research) to design and build transparency assessment method to reduce the occurrence of its risks.

- ***Content assessment***

We suggest content assessment to examine (i) whether there is transparency amongst actors and (ii) whether transparency is relevant to the actor's work boundaries, i.e. tasks, goals or resources. We found that some risks occur as a result of a lack of transparency or irrelevant transparency. Risks such as loss of interest and lack of engagement (discussed in the previous section) can be mitigated by providing information about the level of interest in certain tasks. We also found that information overload can be managed by assessing the relevance of transparency content for actor goals or tasks. We refer to the relevance of transparency as the consistency of the disclosed information with the actor's goals, tasks and demographics.

- ***Timeliness assessment***

This assessment examines transparency to ensure that the information is sufficiently up-to-date to the task at hand [24]. It examines transparency against the activeness of the task or the goal and their specified durations. Risks such as delay in progress and stress may raise as a result of untimely disclosing of information. Timeliness assessment focuses on determining the appropriate time of disclosing the information in order to attain effective transparency.

- ***Presentation assessment***

Presentation assessment examines the consistency of the recipients' presentation requirements and the presentation of disclosed information. Transparency is assessed to identify

the format of information (verbal or visual), the level of details and the type of information (quantitative or qualitative). Identification of transparency presentation is based on the actor's role, preferences, background, cognitive skills and experience. Risks such as lack of collaboration and low performance may occur as a result of the inappropriate presentation of information. This kind of risk can be reduced if the format of transparency and the type of information is understandable to the recipients.

- **Recipients assessment**

Risks such as peers malevolence and conflict of interest may occur as a result of transparency of own information to all members of the organisation. This assessment focuses on identifying actors who have to receive a certain type of information. Checkpoints on this assessment are based on the level of dependency amongst actors, the value of the information to the recipient and the consistency of information with the recipient's work boundaries.

V. DISCUSSION: SOCIAL TRANSPARENCY AS A SERVICE

Enterprises are increasingly recognising the benefits of integrating social computing and networking services into their operations and architecture to support productivity [12]. Furthermore, there is a drive to provide various quality dimensions in their applications such as security, privacy and transparency to maintain internal and external relationships.

As discussed in this paper, social transparency in enterprise applications can enable team members to gather information, learn from each other, detect real-time events, increase collaboration amongst each other and enhance decision-making processes. The ultimate goal is to enable the enterprise to reach its strategic goals more rapidly and at the same time, maintain quality and social requirements such as job satisfaction and perception of openness and fairness. Our findings suggest that introducing social transparency services into enterprise information systems can also introduce risks which can stem from the unguided and completely open style of sharing information within the workspace. Work on enterprise social computing is mainly motivated by learning and information sharing [27]. However, the facilities provided for information sharing are not sensitive to the content and interaction time and audiences. This means the risk assessment is and mitigation are left for the social actors within the system and not assisted via automation.

Our interview study revealed that users of enterprise applications might require more intelligent online social transparency services design, which is personalised and design with risk detection and mitigation as the main requirement. Our analysis demonstrated the need for a method to assess social transparency and avoid potential risks when applying it in enterprise applications. Unlike technical enterprise issues that are assessed by metrics, social transparency voluntarily is a subjective issue, and it is often judgement based.

We found that social transparency in enterprise applications has a dynamic nature and gives it side effects on the day-to-day life of the organisational members. Intentions of enterprise members may change over time. Therefore, we found that decisions about transparency risks and assessment can differ from one actor to another and in the same actor from time to time. Moreover, assessing transparency to mitigate certain risks has a potentiality to cause a domino effect where assessing transparency about one risk might introduce another undesired side effect. For example, enterprises assess transparency to tackle risks caused by lack of transparency amongst their actors such as conflict of goal and task, loss of interest and lack of collaboration. However, the provision of information to avoid the problem of lack of transparency may introduce other risks such as information overload, social loafing and conflict of interest.

Based on our findings, we advocate that the assessment method has to meet various requirements. Here we list some of the initial requirements of such a method.

- 1) Simulate a real-life example of the organisational actors' interactions, behaviour and activities by using a scenario-based approach so that risks are speculated in a more realistic style.

- 2) Engage users with immersive scenarios by using explorative strategies in drama such as role-playing, rehearsal and improvisation [35]. This is for phases like ideation and brainstorming so that solutions and contextual factors are also discovered.

- 3) The assessment process requires to be run over a period of time using techniques like observation and diary studies. The reason is that some issues may emerge over time and some personal and social context can be relevant but hard to capture in a non-naturalistic setting.

- 4) Due to the volatile and emerging nature of transparency risks, the assessment process has to be a lifelong process within the enterprises to keep the knowledge base up-to-date. A reporting system could be envisaged, and solutions around crowdsourcing and social sensing can be employed.

VI. CONCLUSION AND FUTURE WORK

In this paper, we made the argument that social transparency in enterprise application service should undertake a systematic evaluation process to reduce its potential risks and retain its benefits. As a first step, we undertook a qualitative study to explore the transparency requirements in terms of the context and quality and the risk factors leading to adverse effects in certain transparency configurations and settings. Our future work will refine and expand these findings and build and verify a transparency checking framework based on models for organisational information systems with transparency constituents embedded in it.

VII. REFERENCES

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