

# **Towards personalised, socially aware and active e-learning systems**

## **Illustrated with the agent-based system K-InCA**

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### ***Abstract***

This short paper illustrates our approach to e-learning. We first consider the current challenges presented by e-learning (and the limitations of the traditional e-learning systems in fulfilling these needs). In the second section we describe our vision on how e-learning systems could be designed in the future (we identify the features that e-learning systems should support). Finally we analyse how K-InCA, an agent-based system that we have designed to support the acquisition of Knowledge Management concepts and practices, can address the e-learning challenges responding to our vision.

## **1. Introduction**

Many of the existing e-learning systems do not seem to take full advantage of the possibilities offered by current technologies essentially because they are designed to reflect the classic, “lecture style”, teaching approach. Consequently they present several limitations.

Traditional educational approaches have a number of advantages but also have major limitations as (1) the knowledge delivered is frequently difficult to apply and is disconnected from the learner’s current activities; (2) the mode of delivery is not well suited for implicit (not formalised) knowledge (such as experiential skills, social knowledge, etc.); (3) the mode of delivery does not work very well for all the categories of learners (leading to many failures and frustration).

Secondly, the traditional educational approach was designed to fulfil some educational needs that have changed considerably in the last few decades. Private companies as well as society in general now need more creativity, autonomy, and flexibility from people who learn continuously all through their lives, and are capable to interact with a wider range of colleagues. The knowledge necessary to be competitive changes faster than before, old knowledge may become obsolete and even hinder the acquisition of new knowledge. Traditional teaching methods have difficulties to adapt to these new settings.

The objectives of this paper are: (1) to present an approach to e-learning that is more efficient and adapted to the current needs and (2) to outline how information technologies can be used to support our approach. The K-InCA (Knowledge Intelligent Conversational Agent) framework, an agent-based e-learning system that provides very personalised and active support for acquiring Knowledge Management concepts and practices, will help to illustrate this approach.

## 2. The challenges of e-learning & the limitations of the current approaches

Whilst a plethora of e-learning systems have been and are being developed, which take advantage of the available technologies, we believe that overall there is still much space for improvement. In particular we believe that most of the e-learning systems rely too much on the traditional learning approaches and therefore suffer the same flaws such as:

The poor support for the individual dimension:

- **E-learning systems are teacher centric, and not sufficiently user/people centric.** E-learning systems are designed in a way to facilitate the work of the professors, and not to support the individual learning process of the student. For instance assessment is not seen as a way to help students to measure the evolution of their learning capital, but as the measure of the level of achievement of objectives on which learners have little control. As a consequence, students remain relatively passive and dependent on the teacher, and do not adopt the attitude of taking control of their own learning process.
- **E-learning systems do not take sufficiently into account the characteristics of the users.** The diversity of the students' population is often ignored. In particular the same teaching strategies are applied to students who have very different profiles. Too little effort is made to collect and exploit knowledge of student's interests (e.g. motivations), learning styles (e.g. ease with abstraction), personality (e.g. introversion/extraversion), psychological needs, etc. This knowledge should be used in order to improve the effectiveness of the learning process.
- **E-learning systems are often too disconnected from the learner's current activities and goals.** E-learning systems remain too dissociated from knowledge activities and they often propose a learning agenda that is not synchronised with the current user's needs, context, level of detail, etc.

The poor support of the organisational dimension

- **The learning agenda of the user and of the organisation are dissociated.** E-learning systems do not situate learning in the perspective of the organisational need. In particular, the learner has very little indication (if any) about the importance of the

knowledge he is currently acquiring, and how this knowledge contributes to the organisation's learning agenda.

- **E-learning systems do not acknowledge sufficiently the importance of the social process.** Although in the fields of social and cognitive sciences, social processes have long been recognised as a very important element of the learning process<sup>1</sup>, these processes have been largely disregarded (or poorly supported) in current e-learning environments. Allowing interaction amongst learners (through e-mail, chat rooms, etc.) is not enough.

The limited support for the process dimension

- **The learning process support stops too early (at the delivery stage).** Many of the current e-learning systems reflect the classic educational approach where the role of the teacher/mentor/facilitator ceases after the knowledge has been delivered. In particular, e-learning systems are not designed to support knowledge adoption, knowledge use in the workplace, and adaptation of knowledge to the specific users' needs.
- **The poor support of the continuous learning process.** Although they provide a flexible knowledge delivery platform, most e-learning systems do not specifically support just-in-time learning, stimulation of the learner, continuous assessment, and, in general, the continuous learning process.
- **Limited interactivity.** E-learning systems still rely on relatively passive material that the learner has to absorb rather than more active experiences in which the learner is able to experiment with the new knowledge in a safe, free environment.

### **3. Our vision: e-learning should be highly personalised, social and active**

In this section we aim at characterising the most important challenges that an e-learning system should address.

A strong support for the individual dimension

- **E-learning should be user centric.** E-learning systems should put the user/learner at the centre, and also become a key component for managing individual knowledge capital and competence. In particular, e-learning systems should help the learner in continuously assessing the state of their knowledge, identifying the missing gaps and weaknesses, and evaluating the effectiveness of the learning process.

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<sup>1</sup> Many argue that the only possible form of learning is social learning

- **E-learning should be highly personalised.** E-learning systems should develop a very good knowledge of the learner in order to personalise the learning experience, therefore maximising the effectiveness of learning. In particular, e-learning systems should take into account the learner's learning style, interests, preferences, current activities and goals. Using this knowledge, e-learning systems may: identify the more appropriate knowledge to deliver, adapt it to the user context, and select and activate the most adapted learning strategies (propose information, cases, simulations, exchange knowledge, etc.).

#### A strong support for the organisational dimension

- **Learners should be in control of their learning as part of organisational learning.** Individuals should be helped in identifying their individual knowledge capital, comparing it with those of other individuals in the organisation and with the learning objectives of the organisation. On the basis of this analysis, learners can both find out how their knowledge assets can contribute to the organisation's learning agenda and define their future personal learning objectives. E-learning systems should also facilitate this learner empowerment process.
- **E-learning should be socially situated and make use of the social process.** E-learning systems should be able to recognise and exploit the learners' social networks, role models, levels of trust and influence, etc. E-learning systems should also help the learners to situate their learning process socially (how do learners position their knowledge acquisition process in the context of the group?). Finally, e-learning systems should make use of the social process to facilitate the dissemination of knowledge in the organisation. For instance, e-learning systems should provide support for e-learning communities, not only in opening new channels of communication (forum), but also by supporting more substantially the social dynamics in those spaces (with recommender systems, reputation systems, social indicators that enforce social pressure, etc.).

#### An innovative support for the process dimension

- **The support of the learning process includes the adoption phase.** E-learning systems should go far beyond the delivery phase, and in particular ensure that the knowledge is adopted and put into practice. In reality this means that the system is able (to a certain extent) to monitor, understand and model the different phases of adoption of the knowledge by the user. In particular it includes the phases in which the new concepts are experimented with, evaluated, internalised and finally applied.
- **A real support for the continuous learning process.** E-learning systems should support just-in-time learning, stimulation of the learner, continuous assessment, etc. In particular, they should help learners not only to fully integrate learning

directly into their work (by better analysing their current and future activities), but also they should provide motivational support and stimulation. Of course, the integration of the e-learning system with the user productivity tools makes this support seamless.

- **High level of interactivity.** E-learning systems should provide active interaction with the users in the form of a rich choice of interaction strategies (story telling, stimulation, simulations, information structured in a different ways, etc). Agent-based approaches can in particular provide a very active, cognitive and diverse mode of interaction with the user.

## **4. K-InCA: A system for personalised, social and active learning**

In this section we describe how the K-InCA (Knowledge Intelligent Conversational Agent) system addresses the challenges described above.

### **4.1. A description of K-InCA**

#### **K-InCA: an agent-based system for helping users to adopt new behaviours**

K-InCA [1,2,3,4] is an agent-based system designed to help people to adopt new behaviours. The agents within the system examine users' actions and maintain a "behavioural profile" reflecting the level of adoption of the desired behaviours. Based on the user profile, and relying on a model borrowed from change management theories, the agents provide at different stages customised guidance including mentoring, motivation or stimulus in order to support real learning and smooth adoption of new behaviours.

#### **The key approach of K-InCA: learning seen as a change process**

Learning new behaviours and practices is modelled as a change process. Based on the seminal work of Rogers on innovation diffusion [5], which has been adopted and validated extensively in the context of teaching people how to manage change in organisations [6,7], K-InCA assumes five significant stages that individuals normally follow when learning new behaviours. Individuals will initially be unaware of the new behaviours. The first step toward the adoption of these behaviours is to become aware of them, as well as of the underlying concepts. Once aware, individuals might develop interest in the behaviours. This interest, that initially may be relatively passive, can then develop in a stage of trial or appraisal in which individuals experiment on how the new behaviours "work" for them, in their specific situation, given their goals, etc. Finally, if the trial is considered positive, the learners enter the adoption stage (see figure 1).

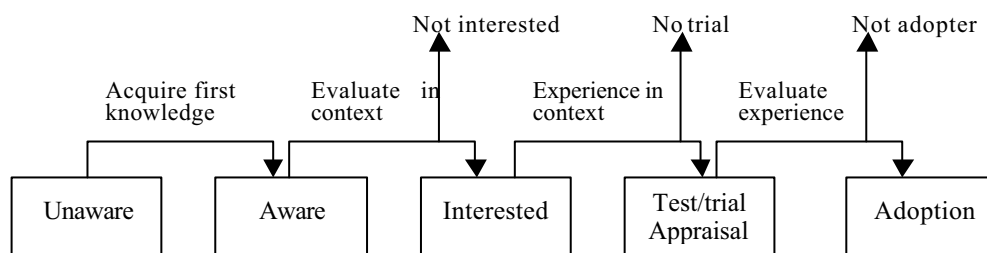


Figure 1 - Adoption process supported by K-InCA

### Using intervention strategies and agents to facilitate the learning process

K-InCA supports learning by facilitating the user transition from unawareness to adoption for each one of the desired behaviours. At any given moment, K-InCA first assesses the users' state and then intervenes in the most appropriate manner given this state. The most appropriate intervention strategies for a given user in a given situation, however, are not only dictated by the user's level of adoption, but also depend on many other factors such as the user's interests, current activity, goals, social network, level of activity, predisposition to innovation<sup>2</sup>, etc.

In the K-InCA system, this information is collected and updated by a set of **diagnostic agents** who analyse the users' actions<sup>3</sup> and store the relevant facts in a **user model**. For a much more detailed description of the relevant users' characteristics and of exactly how this information is collected, represented, and managed, see [2]. The intervention strategies (most of which are directly inspired by educational theories, such as experiential learning, constructivism, etc.) are implemented by a set of **stimulus agents** interacting directly with learners (see [8] for a detailed discussion of how stimulus agents can be used to provide advanced forms of decision and learning support).

#### 4.2. K-InCA: a highly personalised, active and social e-learning system

K-InCA meets the requirements listed in the previous sections to a large extent:

**In the K-InCA system learning is user centric.** Users can, at any time, see what are the final goals of the e-learning system (target behaviours), assess “how well they are doing” in the adoption process, and prioritise their learning agenda.

**The learning process is highly personalised.** By observing the users' actions K-InCA develops a sophisticated user model that allows the selection of: the best learning

<sup>2</sup> For example, most individuals will be more likely to try out behaviours that have already been successfully adopted by their colleagues or by people they trust.

<sup>3</sup> These actions are those normally performed by users in their everyday activity, e.g. having a meeting, sending an e-mail, etc.

(intervention) strategies, the best time to introduce concepts or propose actions, the best interaction style, etc.

**K-InCA allows users to place their learning agenda in the context of the organisation.** The K-InCA system allows users to compare their learning objectives and knowledge assets with those of other members of the community. It keeps track of “producers” and “consumers” of knowledge, and it facilitates contacts between people who have similar interests.

Information about the learner’s social network is exploited by the K-InCA system, firstly to encourage **peer-to-peer learning**, and secondly to **exploit social pressure to support learning**.

**K-InCA supports the learning process beyond the delivery phase.** As described above, knowledge acquisition is seen as just one of the phases of learning. The objective of K-InCA is in fact to support the users also in experiencing the new knowledge, and using it in their working environment.

**K-InCA supports the continuous learning process.** The K-InCA personal agent observes the user's actions. With the help of the diagnostic agents, it establishes which learning "subjects" are currently relevant to the user and what is the level of adoption of those subjects. Through the intervention of the stimulus agents these subjects are presented to the user in the most appropriate manner (based on the level of adoption, the learning style, the interests and the social network of the user). By tuning its proposals to the current learner's activity and state, K-InCA truly supports just-in-time learning and ensures continuous motivation and assessment of the learner.

K-InCA is designed to be integrated in the user's working environment and presentation of information is only one of the possible interventions of the system. In general, **K-InCA is highly interactive**, its proposals to the user may range from a suggestion to reading something, to presenting an interactive story, to suggesting actions to be taken in the real world, to proposing simulations of real world activities. All these interaction modes are implemented through stimulus agents that can be flexibly plugged into the systems (or removed from them) as new teaching strategies become available.

## 5. Conclusions

Whilst the limitations of the "classic" teaching style (“lecture style”) have been known for a very long time, most of the current e-learning systems seem designed to support such methods rather than more innovative ones. New e-learning approaches should support a wide range of learning models (such as experiential learning, collaborative learning, etc.) and adapt to the user's characteristics and current needs. This paper proposes that future e-learning systems should support a personalised, active and socially aware approach, and should ensure that the knowledge learnt is incorporated in the user's

practice. As an example, we have briefly described the K-InCA system that has been designed to meet these requirements.

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