

AN INTEGRATED LEARNING AND KNOWLEDGE MANAGEMENT SYSTEM AND METHOD THEREOF

FIELD OF INVENTION

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The present invention relates to an integrated automated learning and knowledge management system and method. In particular, the present invention provides a learning and knowledge management platform integrated with an artificial intelligence, AI engine which provides recommendations that enables a user to learn and provide training
10 feedback.

BACKGROUND ART

Conventional training courses offered today force the learner to complete an entire
15 syllabus. Most training requires the learners to follow through with a pre-determined syllabus in a course, believing that upon completion, based on the many tests and assessments conducted, assuming a learner's skills are acquired, the learner will be qualified to carry out an assigned task in a workplace or an industry.

20 This poses an issue for those whose pursuit of knowledge and skills are not for formal qualifications but for addressing their knowledge gaps. For a learner whose interest is only in certain topics or course sections within an entire course syllabus, it is unlikely that effective learning occurs for the sections deemed as irrelevant for the learner's goal. These results in excessive time, money and effort spent to achieve the learner's pursuit
25 of addressing their knowledge gaps. The pedagogical or andragogical approach of a one-size-fits-all lesson plan, even if it is for a single class, also places the control of each individual learner's learning journey in the hands of the training provider or the trainer. For instance, experienced professional learners may want to focus only on learning specific topics or sections within an entire course rather than completing the whole
30 course.

Digitalized online courses and modular training are known. However, a system that offers trainers and learners an adaptive solution is still needed. Moreover, beyond the courses offered by various organizations, there is a vast universe of knowledge available,
35 awaiting organization and structure to be accessed by learners.

Conventionally, providers of massive open online courses, MOOC as well as some training providers adopt a modular approach to their courses. However, there is a lack of system, for the training provider as well as the learner, for the implementation of an adaptive solution in these courses. Many of today's learning management platforms, (LMP) provide trainers and learners with customisable learning pathways and collation of courses, modules, and learning and training tools. However, they do not provide an intelligent system for course and learning pathway recommendation. In addition to courses, today's learners have an extensive amount of information available for gaining knowledge and skills which are inherently unstructured unlike in a course. There is a need for an intelligent system that provides learning and training feedback for adaptive training methods, a knowledge management platform, as well as curated and personalised bite-size courses and learning paths. This would transform the learning journey of learners and facilitate a heutagogical approach.

Numerous an integrated learning and knowledge management platforms and systems have been designed to create a learning experience for a user.

One example of an integrated learning and knowledge management platform is disclosed in United State Patent Application No. US 20110177480 A1, hereinafter referred to as US 480 A1 entitled 'Dynamically recommending learning content' having a filing date of 14 January 2011, Applicant: APOLLO EDUCATION GROUP INC. US 480 A1 disclose a method and apparatus for a learning management platform that is based on student profile information. US 480 A1 discloses an AI engine where not only student profile information is taken into consideration but also includes determining the similarities that exist between students and provides an individualized learning recommendation to a student. The learning management platform of US 480 A1 enables students to receive personalized learning recommendations that identify specific content or learning objects that pertain to each individual student. Each learning object is associated with an individual skill and content associated with that skill and the learning object is organized in hierarchy based on the skills associated with the learning objects.

Another example of an integrated learning and knowledge management platform is disclosed in United States Patent Application No. US 20200302296 A1, hereinafter referred to as US 296 A1 entitled "Systems and method for optimizing educational

outcomes using artificial intelligence” having a filing date of 20 March 2020, Applicant: MILLER D. DOUGLAS. US 296 A1 discloses a system, method and apparatus directed to the evaluation of educational content models and generation of optimized content designed to engange proficiency in a particular subject and improve learner’s confidence
 5 in retained knowledge. The method involves individualized educational and career analytics, benchmarking and evaluations using historical and present datasets. The AI engine of US 296 A1 evaluates educational data using AI concepts and generates improved or optimized learning content or outcomes in response to the evaluation.

10 A further example of an integrated learning and knowledge management platform is disclosed in United States Patent Application No. US 20060166174 A1, hereinafter referred to as US 174 A1 entitled “Predictive artificial intelligence and pedagogical agent modeling in the cognitive imprinting of knowledge and skill domains” having a filing date of 21 January 2005, Applicant: ROWE, T ET AL. US 174 A1 discloses a a system and
 15 method for predicting and dynamically adapting the most appropriate content and teaching strategies that aid individual student learning. US 174 A1 is based around a ‘Cognitive Model’ of each student where the model reflects the child’s preferences and what they already know and is built with data from external sources such as parental input, teacher input, student achievements, student questionnaires and testing. The AI
 20 engine of US 174 A1 discovers patterns between the cognitive model or a new student and the collective cognitive models of a population of previous students which will then predict the most effective program of study for a child.

A further example of an integrated learning and knowledge management platform is
 25 disclosed in Singapore Patent Publication No. SG 173130 A1, hereinafter referred to as SG 130 A1, entitled “Apparatus and method for plasma synthesis of Carbon nanotubes” having a filing date of 20 January 2010, Applicant: TIME TO KNOW ESTABLISHMENT. SG 130 A1 disclose a device, system and method of automatic assessment of pedagogic parameters. SG 130 A1 further discloses a method of computer assisted
 30 assessment that includes creating a pre-defined ontology of pedagogic concepts; creating a log of interactions of a student with one or more learning activities, wherein the learning activities are concept-tagged based on ontology; creating a pedagogic Bayesian network based on said log of interactions and based on said ontology and further based on the pedagogic Bayesian network to estimate pedagogic parameter
 35 related to a student.

- A further example of an integrated learning and knowledge management platform is disclosed in Singapore Patent Publication No. SG 10201910315 W, hereinafter referred to as SG 315 W, entitled 'System and method for automated personalized learning and assessment' having a filing date of 5 November 2019, Applicant: AMDON CONSULTING PTE LTD. SG 315 W discloses a system and method for automated personalized learning and assessment where a user selects a course from a list of courses and the system is configured to provide recommendations on other pre-requisite courses that the user can sign up. SG 315 W discloses providing an automated personalized learning and assessment through the recommending and managing of online courses and assessment tests tailored to a user's needs on an on-demand basis. The personalized learning and assessment system of SG 315 W is organized by performance demands and concepts mastered rather than by textbook topics or chapters.
- As outlined above, various integrated learning and knowledge management platforms have been developed for providing personalized learning to a user by creating a human-centered learning experience for the user.

SUMMARY OF INVENTION

The present invention relates to an integrated and knowledge management system and a method thereof. In particular, the present invention provides a learning and knowledge management platform integrated with an artificial intelligence, AI engine which provides
 5 recommendations that enables a user to learn and provide training feedback.

One aspect of the present invention provides an integrated learning and knowledge management system (100) for providing a user with learning and training feedback for
 10 adaptive training. The system comprises a user environment platform (108) which forms a front end interface (102) comprising a plurality of sub-modules on a type of user; an interfacing platform (110) which forms a middle platform (104) comprising a learning management platform (120) that recommends in demand knowledge areas or popular course to course creators for post lesson adaptation of a course design and takes into
 15 account popular learning theories and a combination of pedagogical, andragogical and heutagogical principles to refine recommendations for a user, and a knowledge management platform (122) retains knowledge accumulation, experience and learning habits of the user; an artificial intelligence learning platform (112) which forms a back end platform (106) that receives instructions from the interfacing platform (110) which will
 20 be directed to a recommender system pathway. The learning management platform comprises a scheduler sub-module comprising a plurality of learning cells that are active, semi-active or not-relevant arranged to form a learning journey to the user.

In one form, implementations of the present invention further provide an integrated
 25 learning and knowledge management system (100) wherein the artificial intelligence learning platform (112) as a back end platform (106) that receives instructions from the interfacing platform (110) which will be directed to a recommender system pathway that comprises a first recommendation module (202) providing a recommended path of short or full courses to a user, where the user is a learner, based on inputs from the user's
 30 profile, personal goals and prior training and knowledge; a second recommendation module (204) providing a recommended path of course materials, resources and activities to a user, where the user is a learner, based on inputs from continual assessments, learning behaviour metrics and the first recommendation module (202); a third recommendation module (206) providing a recommended path of a knowledge
 35 management platform content of the user, where the user is a learner, and from other

- users based on the first recommendation module (202) and the second recommendation module (204); a fourth recommendation module (208) providing a recommended path of adaptive learning based on inputs from the first recommendation module (202) and the second recommendation module (204); a fifth recommendation module (210) providing a recommended path of training materials, resources and activities to a user, where the user is a trainer for adaptive improvements based on inputs from the second recommendation module (204); a sixth recommendation module (212) providing a recommended path of training materials to a user, where the user is a trainer for lesson planning based on inputs from the second recommendation module (204) and the fifth recommendation module (210); a seventh recommendation module (214) providing a recommended path of in-demand knowledge areas to course creators based on inputs from the first recommendation module (202), the second recommendation module (204) and the fifth recommendation module (210).
- 15 The user environment platform (108) may provide a front end interface (102) which comprises a plurality of sub-modules on a type of user, the sub-modules are a course creator (114), trainers (116) or learner (118).

- Another aspect of the present invention provides that the plurality of learning cells further comprises a training DNA for providing a course to the learner; an activity module that initiates according to current known learning theories such as through a pedagogy or andragogy approach; a material module that facilitates the activity module; a tool module for providing a range of user experience that works in communication with the activity module and the material module and an assessment probe module for providing feedback for evaluating a combination of activity module, a material module and a tool module to deliver an intended learning outcome within a learning cell.

- Another aspect of the present invention provides that the learning cells are selected from a predetermined set of learning cells relevant to a key learning outcome, and the selection is adapted in response to one or more of preferences provided by the student, information about the prior experience and educational outcomes of the student, learning behavior metrics, and feedback or assessments in relation to one or more learning cells.

- In some implementations of the present invention, the first recommendation module (202) provides a recommended path of short or full courses to a user, where the user is

a learner, based on inputs from the user's profile, personal goals and prior training and knowledge comprises a pre-planned training course path module (230) based on a heutagogy learning process where the module receives information on learning outcome, generic skill competency and technical skill competency and a customized course design based on achievement accomplished by the user.

In some implementations the second recommendation module (204) providing a recommended path of course materials, resources and activities to a user, where the user is a learner or a trainer, based on inputs from continual assessments, learning behaviour metrics and the first recommendation module (202) comprises a course design module where the trainer designs courses that support pedagogy, andragogy or heutagogy for the learner; a course content module for addressing a content format for transferring training information to the learner; an activity module that works in communication as a support to the course design module and the course content module comprising designs in different formats to suit a user's training need; and a feedback module linked to the activity module that utilizes feedback tools.

In some implementations of the course content module for addressing a content format for transferring training information to the learner, the content format is in the form of one or more of a power point presentation programme, videos, web links, text, augmented reality, AR, virtual reality, VR, gamification or holography.

In some implementations the present invention provides that the feedback module linked to the activity module that utilizes feedback tools comprises feedback tools such as polling, text editing, mind map tools, annotation or interactive tools.

In some implementations the present invention provides that the third recommendation module (206) providing a recommended path of a knowledge management platform content of the user, where the user is a learner, and from other users based on the first recommendation module (202) and the second recommendation module (204) comprises a material or resource recommendation tool module that proposes study materials obtained from a knowledge base unit (216) to the user in assisting their learning process by providing material suggestions.

In some implementations the present invention provides that the knowledge base unit (216) providing material suggestions comprises material sources from You tube, web-link or documents.

- 5 In some implementations the present invention provides that the fourth recommendation module (208) providing a recommended path of adaptive learning based on inputs from the first recommendation module (202) and the second recommendation module (204) comprises a career based course module for assisting a learner through effective and interactive recommendation to acquire skills for career development and goals.

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- In some implementations the present invention provides that the fifth recommendation module (210) providing a recommended path of training materials, resources and activities to a user, where the user is a trainer for adaptive improvements based on inputs from the second recommendation module (204) comprises a knowledge management module having a learning material storage and learning content book marking; a course option module that recommends to the user a list of course options based on a human resource list, career path recommender or data available in the system; a knowledge retention module for enabling a learner to organize or arrange information for retrieval according to a learner's learning needs where the learner is able to perform enforcement, ad-hoc type of revisions that aids in knowledge retention of the learner.
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- Another aspect of the present invention provides a method (700) for integrated learning and knowledge management to a user. The method comprising steps of selecting a user environment comprising a course creator, trainers or learners which forms a front end of an integrated learning and knowledge management system(702); collecting a user's profile data in real time based on a user's experience and psychometric questions (704); collecting real time data of a user on learning behaviour and continual assessment metrics that provides an indication on the user's learning state (706); retrieving data on goals and aspirations of a user (708); selecting a learning management platform pathway or a knowledge management platform pathway from an interfacing platform which forms a middle platform of the integrated learning and knowledge management system (710). If the learning management platform pathway is selected, initiating a scheduler to arrange a plurality of learning cells having a training DNA to form a learning journey for the user. If the knowledge management platform pathway is selected,
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selecting a course by the user (402); initiating videos, audios, AR images, articles, text or documents, images, links or course contents received from the course (404) book-marking selected contents (406) into document or text, presentation, videos, assessment, voices and web links; organizing the bookmarked contents to sub-modules
 5 such as examination, subjected related, for memorization, for refreshing, ad-hoc learning and archives (408); initiating a learning retention sub-module for personalized learning comprising emphasis, pattern mapping, recall, categories, recent contents, personalization and hybrid (410); reflecting the bookmarked contents in a user interface (412) such as mobile device, laptop or PC, AR or VR device or holographic projection;
 10 receiving external feedbacks based on the bookmarked content from an AI Career Path learning recommendation (416), an AI Driven Learning (414), Job Fulfilment requirement (420) and learner's profile (418) which provides information in course recommendation to a learner and recommending of courses to a user (422) in micro-learning form, course sub-module, full course or course bundling for selection. The method finally comprises
 15 step of selecting one or more recommendation modules from an artificial intelligence or machine learning platform which forms the back end platform where the recommendation modules (712).

According to another aspect, the present invention provides a method for automatically
 20 generating a training module for a specific student and for a specific key learning outcome, including the steps of determining a required learning pathway (802), selecting a series of learning cells with training DNA and other characteristics in order to facilitate that training module (804), including alternative and supplementary learning cells, so that a plurality of the learning cells have a plurality of possible next learning cells, each
 25 learning cell including an assessment component, and responsive to that assessment component selecting the next learning cell for the training module (806), and repeating that process which each learning cell until the key learning outcome is determined to have been achieved (808).

30 Another aspect of the present invention provides a method that further includes determining a required learning pathway of the learning cells comprises steps of depending on assessment components and user feedback.

Relative to the prior art references discussed, none of these disclose a system having a
 35 combination of course creators, trainers and learners as users within an integrated

learning and knowledge management system. Preferred implementations of the present invention are equipped with at least 7 modules that work in communication with each other to provide an adaptive learning experience. Further, none of the prior arts disclose an interfacing platform of an integrated learning and knowledge management system that has a learning management platform and a knowledge management platform. The present invention digitalizes digitized information, combining both human and artificial intelligence, to promote an efficient and effective learning journey, enabling a user to learn, recall, and apply the knowledge in real life.

Implementations of the present invention use theoretical principles of a training DNA and learning cells concept. The dynamics of interactive and ever-evolving entities of an artificial intelligence that is alive are the next steps towards propagating theories and beliefs that promote effective learning within learners of various ages and stages in their careers. Furthermore, it attempts to manifest a flexible and customized learning journey provisioned to serve every learner and guide every trainer to achieve adequate absorption of knowledge on an individual as well within an organization level. Through bite-sized courses, curated learning paths and an intelligent system that receives feedback for adaptive training methods and knowledge management platforms, a smart strategy would elevate and alter learning practices for good and facilitate a heutagogical approach for trainers and course creators.

The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by references to specific
5 embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

- 10 Figure 1.0 illustrates a general architecture of the integrated learning and knowledge management system of the present invention.

Figure 2.0 is a schematic diagram showing input and output flow for each recommender of the integrated learning and knowledge management system of the present invention.

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Figure 3.0 illustrates a scheduler of the integrated learning and knowledge management.

Figure 4.0a illustrates an example of a learning management platform of the second recommendation module.

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Figure 4.0b illustrates a flow of a module initiation within the knowledge management platform.

Figure 5.0a illustrates a general architecture of the recommendation module.

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Figure 5.0b illustrates a flow path of the first and fourth recommendation module.

Figure 5.0c illustrates a flow path of the third and seventh recommendation module.

- 30 Figure 5.0d illustrates a flow path of the second, fifth and sixth recommendation module by reinforcement learning.

Figure 6.0a illustrates a typical training flow of a user's learning journey.

- 35 Figure 6.0b illustrates an example of a learning cell that produces a learning outcome.

Figure 6.0c illustrates an example of a learning cell that produces personalized knowledge.

Figure 6.0d illustrates a typical arrangement of learning cells that forms a learning
5 journey.

Figure 6.0e illustrates the application of alternative learning cells in a learning journey.

Figure 6.0f illustrates the application of alternative and supplementary learning cells in a
10 learning journey

Figure 6.0g illustrates an example of a typical learning cell arrangement of a prior art.

Figure 6.0h illustrates a learning cell arrangement undertaking an original path, applying
15 alternative learning cells and supplement and alternative learning cells of the present invention.

Figure 6.0i illustrates a possible learning cells arrangement of a learner.

20 Figure 6.0j illustrates examples of tagging information for the learning cells.

Figure 6.0k illustrates an example of learning cells and the percentage of reception of each leaning cell.

25 Figure 6.0l illustrates a learning journey of a learner showing links on consolidated information received by the learning cells.

Figure 6.0m illustrates an example of targeted knowledge of a learning cell updated with extension and expansion.

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Figure 6.0n illustrates an example of targeted enhancement for a learning journey.

Figure 6.0o illustrates an example of arrangement of personalized information during the course of a learner's learning journey.

Figure 6.0p illustrates an example of connecting knowledge of learning cells to form a knowledge base.

5 Figure 6.0q illustrates an example of linking relevant information of learning cells to create wisdom.

Figure 6.0r illustrates the links between learning cells to emphasis learning and understanding of a subject matter.

10 Figure 6.0s illustrates an example of prompting of new knowledge from information from other learning cells.

Figure 6.0t is a schematic mapping on strategic planning analytics.

15 Figure 6.0u is a graph illustrating innovative creation on time which involves data analytics, machine learning and deep learning.

Figure 7.0 is a method for integrated learning and knowledge management to a user of the present invention.

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Figure 8.0 is a method for automatically generating a training module.

DETAILED DESCRIPTION OF THE DRAWINGS

The present invention relates to an integrated and knowledge management system and a method thereof. In particular, the present invention provides a learning and knowledge management platform integrated with an artificial intelligence, AI engine which provides recommendations that enables a user to learn and provide training feedback. Hereinafter, this specification will describe the present invention according to the preferred embodiments. It is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned without departing from the scope of the appended claims.

The present invention provides a system that has three server-side components namely a learning management platform with a course marketplace, an artificial intelligence engine comprising various recommender systems and a knowledge management platform.

The integrated learning and knowledge management system (100) provides a user with learning and training feedback for adaptive training, knowledge management and personalised short courses and learning paths. In describing further on the learning management platform, reference is made to Figure 1.0 illustrating a general architecture of the integrated learning and knowledge management system of the present invention.

The system comprises a user environment platform (108) which forms a front end interface (102) comprising a plurality of sub-modules on a type of user, an interfacing platform (110) which forms a middle platform (104) comprises a learning management platform (120) or a knowledge management platform (122) and an artificial intelligence learning platform (112) which forms a back end platform (106) that receives instructions from the interfacing platform (110) which will be directed to a recommender system pathway. The user environment platform (108) comprises that the type of users are a course creator (114), trainer or educators (116) or learners or students (118). A course creator is a unique individual who develops virtual learning materials. The course creator creates training DNA which forms a training path or data for the functioning of learning cells which will be further described. A trainer or educator is a person in charge of training or educating, facilitating a learning journey. A learner or student is a unique

individual who is part of the integrated learning and knowledge management system and who is using and going through a learning journey.

5 A main feature of the present invention is the recommender system. The recommender system which is part of the artificial intelligence learning platform (112) comprises seven recommendation modules. Each of the seven recommendation module work in communication with each other. The recommendation modules are linked in an ad hoc manner as illustrated in Figure 2.0. Figure 2.0 is a schematic diagram of an input and output flow for each recommender of the integrated learning and knowledge
10 management system of the present invention. Each of the recommendation modules and their functions is further described.

Recommendation Modules

15 A first recommendation module

A first recommendation module (202) provides a recommended path of short or full courses to a user, where the user is a learner, based on inputs from the user's profile (218), personal goals and prior training and knowledge. The first recommendation module comprises a pre-planned training course path module (230) based on a
20 heutagogy learning process where the module receives information on learning outcome, generic skill competency and technical skill competency and a customized course design based on achievement accomplished by the user.

It recommends courses and course training materials (232), in bite-size or complete
25 training, to learners according to the learner's profile data.

The first recommendation module may be modified to perform mandatory achievements to design a course path customized to their career needs.

30 This model is used when a clear aim or objective is necessary to attain for example a business goal. Examples can include credential retention and a company's internal training for the job requirement.

An example of utilizing a first recommendation module (202) is for a model on allowing a
35 human resource user to pre-plan a training course path that includes multiple courses for

the relevant learner. The input will comprise learning outcome, generic skill competency, GSC or technical skill competency, TSC. The evolution of a professional, practical and physical analytic model serves to support the heutagogy learning process.

- 5 Using the present invention, learners can optimize the courses to attend based on available micro-courses which are focused on developing skills.

An expert in the field will not be required to complete basic modules which comprise a course, but focus on essential modules to retain their credential. This facilitates an
10 efficient and productive achievement of business goals.

A second recommendation module

A second recommendation module (204) provides a recommended path of course
15 materials, resources and activities to a user, where the user is a learner, based on inputs from continual assessments, learning behaviour metrics and the first recommendation module (202).

It recommends course materials, resources, and activities to learners during their
20 learning based on inputs from continual assessments, learning behaviours metrics in relation to the first recommendation module (202). The second recommendation module (204) takes into consideration knowledge transfer theories (240) and learning theories (248). Knowledge transfer theories include a pedagogy, andragogy and heutagogy approach to learning whereas examples of learning theories are cognitive, behaviour,
25 constructive, humanism, transformative, social learning and experiential.

The second recommendation module comprises a course design module, a course content module, activities module and a feedback module.

30 Course Design Module, CDM

The CDM (306) involves an expert or trainer that designs the course. The trainer designs courses that support pedagogy, andragogy or heutagogy approach for the learner. Based on the achievement level of each CDM, a path gate will decide the next course of
35 action that a pedagogy scheduler requires.

CDM is a module in teaching and learning that evolves and supports an action. CDM forms a micro component of a complex Training DNA. One essential function of CDM is to measure the effectiveness of the actions in the teaching or learning process to address various scenarios.

The CDM module comprises a learning process path (258), duration and feedback module (260) that is learner-centric which further includes a personalized path, custom duration and valuable insights.

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The CDM module adopts various pedagogy and andragogy approach learning that are content-centric, involves facilitation and collaboration. Content-centric would involve programmes such as interactive material sharing, “Mini-reflective” and “Self-reflective”. Facilitation will include a ‘Think and Listen’, ‘Go-Round’, ‘Brainstorming’, ‘Check-in’, ‘Mind Maps’, ‘Affinity grouping’, ‘Multi-voting’, ‘Six Thinking Hats’ or World Café programme. Collaboration will involve peer engagement, mentoring, virtual co-working and brainstorming components.

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Course Content Module (CCM)

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The CCM (302) functions mainly to address a content format for transferring training information to the learner. CCM addresses individual learner's visual, auditory, reading or writing, kinaesthetic or visual, aural, read and kinaesthetic, VARK requirements. The VARK model of the CMM may potentially evolve and include new technologies like augmented reality, AR, virtual reality, VR, Gamification or Holography. The media used may be in power point form, PPT, video, web link or text.

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Activities Module (AM)

The activities module (304) comprises various tools that support the delivery of each CDM, Course Design Module collaborating with the appropriate CCM, Course Content Module. The design can accommodate similar content in a different format such as in powerpoint, PPT format, video or web link or text to convey a single concept. The learner selects a format based on their training requirement.

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Feedback Module

Each activity module is linked to a Feedback Module (312), FM that uses feedback tools like polling, text editing, mind map tools, annotation, or other interactive tools. A trainer is
 5 able to introduce a poll mid-course to gain an opinion about course progress and a survey at the end of a course, for a more detailed and comprehensive finding on a learner's sentiment or opinion with respect to the course and its delivery.

A third recommendation module

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A third recommendation module (206) provides a recommended path of a knowledge management platform content of the user, where the user is a learner, and from other users based on the first recommendation module (202) and the second recommendation module (204). The third recommendation module comprises a material or resource
 15 recommendation tool module that proposes study materials obtained from a knowledge base unit (216) to the user in assisting their learning process by providing material suggestions. It recommends content from the knowledge management platform of the same learner and from other learners.

20 Upon accumulation of study material in the knowledge base unit (216) and a user's profile (218) of the system of the present invention, the system will promote a suitable study material from the knowledge base unit to learners to assist in their learning process.

25 The knowledge base unit can offer study material suggestions taking into consideration study notes which have been added by the user in a previous series of revision or study in the system or from open sources like YouTube, web-link, or documents.

A fourth recommendation module

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A fourth recommendation module (208) provides a recommended path of adaptive learning based on inputs from the first recommendation module (202) and the second recommendation module (204). The fourth recommendation module (208) comprises a career based course module for assisting a learner through effective and interactive
 35 recommendation to acquire skills for career development and goals.

It recommends an adaptive learning pathway to learners and includes a personalized or customized training package for the learner.

- 5 An example is the fourth recommendation module (208) comprises a model on a course to achieve a career goal. Through effective and interactive recommendations and assistance, a user acquires requisite skills that are crucial to career development and goals.

10 A fifth recommendation module

A fifth recommendation module (210) provides a recommended path of training materials, resources and activities to a user, where the user is a trainer for adaptive (252) improvements based on inputs from the second recommendation module (204).

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The fifth recommendation module (210) further comprises a knowledge management module, a course option module and a knowledge retention module. The knowledge management module comprises a learning material storage unit and a learning content book marking or commenting unit. The course option module recommends to the user a

20 list of course options based on a human resource list, career path recommender or data available in the system. The knowledge retention module functions to enable a learner to organize or arrange information for retrieval according to a learner's learning needs where the learner is able to perform enforcement, ad-hoc type of revisions that aids in knowledge retention of the learner.

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A sixth recommendation module

- A sixth recommendation module (212) provides a recommended path of training materials to a user, where the user is a trainer for lesson planning (256) based on inputs
- 30 from the second recommendation module (204) and the fifth recommendation module (210).

A seventh recommendation module

A seventh recommendation module (214) provides a recommended path of in-demand knowledge areas to course creators based on inputs from the first recommendation module (202), the second recommendation module (204) and the fifth recommendation module (210). The seventh recommendation module (214) received information from training material knowledge base (238) and other learner's knowledge base collection (220) to come up with a course design (222) which includes modular courses (224) and course training material (228).

The seven recommendation modules are run by various recommender systems of an artificial intelligence, AI engine. These recommendation modules work separately but are not independent of one another. The output of one recommendation module can influence the action of another recommendation module in the system.

The application of the recommendation modules is for synchronous or asynchronous training types, although certain materials and recommender outputs are more suitable for certain types of training. Training and course materials include all modes of content delivery and learner interaction with the content within the learning environment of the the integrated learning and knowledge management.

For example at stages such as planning, adaptation of the learning process and feedback involving either the learner and trainer or trainer and course creator, one or more recommendation modules are required.

For the planning stage, the proposed recommendation module for the learner is the first recommendation module (202) involving course recommendation and the fourth recommendation module (208) involving a learning pathway recommendation from the first recommendation module (202). For the trainer, the sixth recommendation module (212) on training materials for lesson plan prior to a lesson is proposed.

For the adaptation of the learning process and feedback stage, the proposed recommendation module for the learner is the second recommendation module (204) involving course materials, resources and activities, the third recommendation module (206) involving personal learning resources for self-study and reference and a fourth recommendation module (208) for a dynamic training path adjustment based on the

second recommendation module (204). For the trainer the fifth recommendation module (210) on suggesting training material for in-lesson implementation is proposed.

For the feedback stage, the proposed recommendation module for the trainer is the sixth recommendation module (212) on post-lesson adaptation of training materials for future lessons and for the course creator, the seventh recommendation module (214) on post-lesson adaptation of course design is proposed.

Besides, the seven recommendation module (214) is based on techniques of machine-learning, collaborative filtering, rules-based recommendation, topic modeling and data science techniques.

The artificial intelligence, AI engine that enables the recommendation modules to be run is designed to create a human-centered learning experience for the learner by considering experience, current state, and future goals of the learner in making recommendations. This involves collection of data from user profiling from multiple waypoints in time of the learner's experience as well as data from psychometric based questions. Further, learning behavior and continual assessment metrics data is collected that takes into account real-time data that provides an indication of the current learning state of the learner. The user profiling also includes data collection on the goals and aspirations of the learner.

The artificial intelligence concept used in the present invention is the Neural Collaborative Filtering method whereby the Neural Collaborative Filtering (NCF) is a generalized framework to perform collaborative filtering in recommender systems using Deep Neural Networks (DNN). The (NCF) uses the non-linearity, complexity with the ability to provide optimized results of (DNN)s to achieve a complex user-item interactions. In particular, the NCF method as disclosed by He, Xiangnan et al is referred to for development of the present invention. For example, in utilizing the collaborative filter, there are a few basic layers such as the input layer, embeddings layer, neural collaborative filter layers and output layer. The input layer defines the input features which includes the trainee information, course information and input data size. A content-based representation is used first by asking the trainees' interested fields and putting them as initial values. The input can come from various sources, including survey report or enterprise-customized training paths. As and when more data is collected from users,

there are various aspects that form part of the input such as user training history, training chains or paths for learners, motivation of the learners, contents acquired under knowledge management and training requirements. The embeddings layer converts the input into trainee latent vector and course latent vector. The neural collaborative filter
 5 puts the embeddings together and predicts the likelihood of the trainee to like each course in the list. Finally, the output layer defines the output which is a pair-wise value for each trainee-course pair. The output layer includes a learner, a trainer, a training provider and industry enterprises or regulators.

10 The artificial intelligence based on NCF using DNN plays a significant role in promoting habitual learning in the system of the present invention. According to a user's past action, the system will be able to predict the user's preference on material types such as text, images, videos, sounds or exercises. For each course material, the percentage of usage for the user is predicted. A multi-layer-perceptron that comprises an input layer and an
 15 output layer is further used. The input layer defines the input features for the trainee. The time that user spent on each type of material, the excise score after using each type of material and the number of revisits of that type of material. The input is based on how a trainee reacts to different sources. Interfaces include interaction interfaces with learners. This format can range from a traditional PowerPoint, video, or text to Virtual Reality or
 20 even holographic. The interface could be a current mobile device, computer, simulator or any other new gadget that can interact and engage with the learners.

Each learning cell will be embedded with certain learning theories. From pedagogy, andragogy and heutagogy, each content will have various form of interfaces as
 25 described above. Different industries will have different training requirement which includes physical involvement and online requirements. The output layer defines the probability of effective usage of each type of material. The output will be based on available resources and recommend the most effective training cell or module to learner.

30 The AI Engine of the present invention also takes into account popular learning theories and related pedagogical, andragogical and heutagogical approaches to refine recommendations.

A general architecture on the recommendation module is shown in Figure 5.0a. The
 35 diagram illustrates the evolutionary interaction between a database which is Amazon

DynamoDB, a Recommender Model, and a cloud container which is the Amazon S3 Bucket. This is a basic framework of the recommendation modules of the present invention.

5 In describing further on the first (202) and fourth (208) recommendation module, reference is made to Figure 5.0b. The fourth recommendation module is known as the shortest path solver providing a short path for evaluating optimal approaches and recommends courses aligning most with the user's goals. Finally, inputs from a collaborative filter and habitual learning are combined with the recommended courses
10 and fed to a course recommender, the first recommendation module to suggest accurate training course to suit a user's interest.

In describing further on the third (206) and seventh (214) recommendation module, reference is made to Figure 5.0c. To recommend learning material, the inputs from the
15 collaborative filter, habitual learning and popularity courses are considered as inputs into the learning material recommender, the third recommendation module. Combined with the user feedback and the learning material obtained after optimization, the Auto Adaptive Learning Material Recommender, the seventh recommendation module produces customized knowledge bundles.

20 For the second recommendation module (204), fifth recommendation module (210) and sixth recommendation module (212), reinforcement learning is used to train the agent to provide the relevant next step for the users which are either the learners or trainers. A Q learning algorithm is implemented for each user by finding the optimal strategy for each
25 user while they are learning or creating training materials. Different formats such as text, animation, plots, case study, coding are used in the recommendation module as action space.

In describing further on reinforcement learning, reference is made to Figure 5.0d.
30 Reinforcement learning trains the agent to recognize the best way forward for a trainer or learner by taking into account their various decisions in the past. Furthermore, the Q learning algorithm implemented for each user personalizes their experience while they learn or create training material by finding the optimal strategy. The above is accomplished by continuous monitoring and basing predictions on the actions developed
35 in the action space.

Figure 3.0 illustrates a scheduler (308) of a learning management platform (120). The scheduler (308) comprises learning cells which comprises training DNA and relevant tools, materials, activity tools and assessment probes which form a learning journey. The learning cells are further described in Figure 6.0a to Figure 6.0t. The scheduler (308) is present in each learning management platform (120) for each recommendation module.

Principles and Theories of the Present Invention

Typically, most training require learners to follow through with a pre-determined syllabus in a course, believing that upon completion, based on the many tests and assessments conducted and assuming a learner's skills are acquired, the learner will be qualified to carry out assigned tasks in a workplace or an industry. This process is considered restrictive as it does not cater to the needs of a variety of learners whose pursuit of knowledge and skills is to address their knowledge gaps and not to gain formal qualifications.

A typical training flow is illustrated in Figure 6.0a. A learner's profile will be input into a learning management platform. A trainer in general, will lead the introduction involving a pedagogy approach by utilizing tools, activities and materials before a content centric video is played. The video involving a pedagogy approach also utilizes tools, activities and materials present in the system. Next, is the brain storming step prior to a group problem solving step involving an andragogy approach. The learner then comes up with a presentation that utilizes tools, activities and materials before a final assessment is undertaken by the user.

Basic Elements of the integrated learning and knowledge management

Each training path of the integrated learning and knowledge management system of the present invention comprises multiple training DNA paths that include subject expertise of course designer, learning theories used, materials & contents, assessment and others. Furthermore, the advancement of technology contributes to the complexity and variety of the training DNA path. The term training DNA refers to the set of data in each learning cell which can be used to position the learning cells with a DNA training pathway so that

the learning cells can be positioned in a matrix, for example as shown in figure 6.0k or 6.0m, for a specific student and and for a specific key learning outcome.

Furthermore, various learning theories vary with overlapping properties. Therefore, similar training theories application will result in multiple results on different people. Example, the subject field and materials used on the same person can also affect consequences contributing to a growing list and providing diverse complex variants. Therefore, the receptiveness of different learners to different training DNA pathways will vary. A model of a combination of pedagogy, andragogy and heutagogy approach will provide a different training DNA pathway in a training module.

From a learner's perspective, efficient training is by learning a new skill and knowledge that can be applied in an actual situation after a training journey. Training includes a structured, semi-structured, unstructured, or a mixture of the arrangements.

Examples of unstructured training are from failures and real-life experience of a user or learner. Accumulated experience and knowledge of users form different training DNA pathway that achieve the same learning outcome. Self-learning and experiences form part of the self-created training DNA pathway that is unique to each individual.

To match the most accurate training DNA pathway with a learner includes identifying the target learner, scope of the invention, the time and position, the reason for learning a course and the course design.

The training DNA is an essential component within a learning cell of a scheduler (308) of a learning management platform (120).

Learning Cells

The main component of a scheduler of the learning management platform is the learning cells. For the purposes of the specification and claims, a learning cell is a small part of a learning process that provides meaning to learning for the user. A learning cell can be active, semi-active or not relevant.

Each of the plurality of learning cells comprises a training DNA for providing a course to the learner, an activity module that initiates according to current known learning theories

such as through a pedagogy or andragogy approach, a material module that facilitates the activity module, a tool module for providing a range of user experience that works in communication with the activity module and the material module, and an assessment probe module for providing feedback for evaluating a combination of activity module, a material module and a tool module to deliver an intended learning outcome within a learning cell.

The learning cells are selected from a predetermined set of learning cells relevant to a key learning outcome, and the selection is adapted in response to one or more of preferences provided by the student, information about the prior experience and educational outcomes of the student, learning behavior metrics, and feedback or assessments in relation to one or more learning cells.

Active learning cells are cells that provide a piece of information and get the current attention of the user or learner. The impact can be positive or negative and meaningful or useless. Meaningful information will trigger formation of an active cell that has significant purpose for a user or learner.

Semi active cells are stored in the system. The knowledge of these cells can be re-activated when necessary.

Not-relevant cells are learning cells that are deemed not relevant to a user. This is due to a user or learner that has already acquired the knowledge or a training DNA pathway that does not match the user or learner's demand. These cells can be evolved from active or semi-active cells.

The first type of learning cell comprises material, tools, planned activities and an assessment probe to form a small unit to perform training pedagogy or andragogy activities. A structured learning cell typically exists in a structured or semi-structured course that a training provider designs. As shown in Figure 6.0b, input received from an individual, who is the user or learner will activate a learning cell and initiate a training DNA pathway by utilizing materials, tools, planned activities and an assessment probe that provides a learning outcome with a positive or negative reception. The materials include texts, videos, sounds, physical items, and anything that is used for or facilitates the planned activities. The form of material will change depending on the advancement

of technologies, including the current or any other advanced technologies materials from Augmented Reality, AR, Virtual Reality, VR, Holographic, and Metaverse.

5 Examples of tools include a classroom set-up, physical set up involving props, experiment set up, or online tools, mobile devices, and web access. Tools may also include the media, physically or virtually, providing interfacing between the learner and the system.

10 With the combination of tools and materials, a planned activity is carried out according to current known learning theory that includes a pedagogy or andragogy approach. With the available technology and tools, a new method of knowledge transfer can be adapted accordingly should modification be required.

15 The assessment probe comes in simple tests, online user behaviour, involvement, and other assessments method. The assessment probe will be the critical feedback channel for evaluating the combination of materials, tools and plans to deliver the intended learning outcome.

20 The assessment probe triggers the next learning pathway. The assessment probe further triggers a trainer or facilitator's necessary action. A combination of assessment probes can identify course design gaps.

25 The matching of training DNA pathway and a user or learner's current requirement stage will prompt the most relevant learning cell to the user or learner.

The second type of learning cell comprises materials or information organized accordingly to a user's preference. For example, the source originates from experience, information gathered or a learning cell that arranges in a knowledge base format. As further illustrated in Figure 6.0c, input received from an individual, who is the user or learner, will activate a learning cell and initiate a training DNA pathway by utilizing materials or information that provides a learning outcome of personalized knowledge for a learner.

35 Activation of an active learning cell occurs when learning instructions are received by a learning cell with a particular training DNA pathway that activates an active learning cell.

The active learning cell can be stored digitally and digitalized through the systems, and a portion of data, information, knowledge and wisdom, DIKW will remain within the human brain.

- 5 Learning cells will be added to achieve similar learning outcomes by using activities, materials, tools or any combination to address other needs of the different target audiences. Non-effective learning cells will be phased out or modified to improve the effectiveness and efficiency of the user's learning journey. The accumulated effect of these learning cells will provide a path to achieving the key learning outcome in a learner
10 or user's learning journey.

There are four main learning and training theories namely pedagogy, andragogy, heutagogy and hybrid learning that is embedded in each learning cell.

15 **Pedagogy**

In general, Pedagogy is the method of teaching an academic subject or theoretical concept and is a top-down approach where the trainer takes the lead in talking or illustration.

20 **Andragogy**

Andragogy is learner-centric where the trainer becomes a facilitator to the learner.

Heutagogy

- Heutagogy learners will decide the suitable learning path to suit their needs, including
25 contents, learning objective and further taking into consideration time.

Hybrid Learning

The creativity and advancement of technologies makes combining learning theories possible.

- 30 Another essential component of a learning cell is the training DNA. A training DNA path within the learning cells involves initialization of the training path depending on the learning cells, alternating learning cell add on and supplementary and alternate learning cell add-on. For example, a typical arrangement of learning cells as shown in Figure 6.0d illustrates initialization of a learning journey. The number of learning cells to achieve a
35 learning journey is at least three learning cells. It can involve pedagogy content learning

cells and moves on to andragogy content learning cells before the final assessment. With the implementation of assessment probes, there will be prompting to the trainer and course creator of learning cells that indicate where 25% of the users or learners do not understand the course. As shown in Figure 6.0e, where activation of learning cells is below 25%, a trainer may be prompted to facilitate the users or a course designer can propose an alternative course. Figure 6.0f shows supplementary and alternate learning cell add-on where should majority of the users not comprehend the course and achieve the goals set by following the training DNA, the course creators will be prompted to modify the course by utilizing the necessary tools.

Training Journey

The learning cells of the present invention comprise learning cells that include an assessment probe. Figure 6.0g is a prior art on learning management platform that do not comprise assessment probes and any detectable component. In contrast, as shown in Figure 6.0h, a learning journey arrangement is illustrated by connection of the learning cells. In general, a learner is set to take an original path. However, depending on a learner's journey, alternative and supplementary learning cells may be modified and added to ensure a learner reaches their learning goals. With the implementation of the platform, learners will be directed to the learning cell that maps the training DNA of the learner. The assessment probe controls the simple mechanism evaluating a learner's decision.

The learning journey of each user differs and is unique for each learner. As shown in Figure 6.0i, it illustrates possible learning journeys across a learning path. The gaps of learning cells that are not highlighted indicate that the learning cell is not relevant to a learner. The highlighted learning cells indicate that the learner requires learning in a particular scope of the learning journey.

While the learning journey can be facilitated, the goal of using the learning management platform is to encourage a heutagogy approach to learning for a learner.

Information can come in different forms and shapes, digitally or in analogue. This information can come from information vets and digitized from various available current or future technologies during the learning journey which may include voice or video recording.

With the vast information, tagging is necessary for the integrated learning and knowledge management. The examples of tagging information is shown in Figure 6.0j where information from learning cells, the internet or other sources that provide various formats of content are tagged and organized based on objective. The two type of tagging are system tagging and manual tagging. For system tagging, tagging is carried out by detecting a learner's behaviour during the learning journey. Manual tagging is the process that involves manually organizing the information to suit a learner's own preference using a simple tagging method.

A learning journey can be further illustrated in Figure 6.0k where the learning cells are highlighted based on high reception, moderate reception, low reception and non active learning cells. Analysis on the percentage of reception of a learning cell will create a unique learning journey that takes into consideration the highest percentage of learning reception. Figure 6.0l is a further illustration on a learning journey of a learner where the learner consolidates information according to their preference and needs to form knowledge they can apply practically. The consolidation, re-arrangement and re-organization of information will connect one learning cell to another that forms a unique learning journey for a learner.

In enhancing a learning journey of a learner, an identifying, improvement, enhancement and enforcement mechanism enables identification of learning cells at a fast rate to enhance, enforce, expand and extend the knowledge store.

The learning management platform comprises multiple levels of learning cells which links from individual to segmentation to different groups or industries. As a result, the structure of the system can accurately identify areas for improvement, enhancement or enforcement.

Improvement focuses on the improvement of the reception of the learner to a particular learning cell. Applying structured training requires additional assessment to validate the effect after enhancement. As shown in Figure 6.0m, a targeted knowledge is updated with expansion or extension. Expansion refers to the evolution of the contents of active learning cells to improve the broader coverage of knowledge in terms of content.

Extension refers to extending the connection with other external materials.

Enhancement involves the training learning outcome update, amendment, improvement or add-on. This enables the respective learner to be identified accurately based on the areas that require more attention. In addition, applying such ability can scale from individual to segment of people involved. These include a targeted and personalized learning journey. Figure 6.0n shows an example of targeted enhancement for a learning journey. The learning cells are updated and replaced to enhance the learning journey.

Enforcement involves personalized information arrangement, connecting knowledge to form a knowledge base, forming wisdom to resolve real-life problems, enforcement or emphasis on knowledge or new learning.

The integrated learning and knowledge management system allows the learner to organize the information or knowledge according to their preference. Figure 6.0o illustrates an example of arrangement of personalized information during the course of a learner's learning journey. Arrangement of information includes text bookmark, voice bookmark, annotation or bookmarking a specific period for a video clip. The key objective is to quickly retrieve related information according to individual preference.

Expiration of non-active learning cells will first retire from the individual portfolio and gradually expire or be discarded when the learning cell becomes irrelevant.

An example of connecting knowledge to form a knowledge base is illustrated in Figure 6.0p. The creation of knowledgebase allows learners to connect information according to their preferences. The combined effect will help the learner to re-learn a related data to create a knowledgebase according to their choice.

Ultimately, the learning management platform is designed to enable a user to form wisdom or enable them to resolve real life problems. Figure 6.0q illustrates the linking of relevant information to create wisdom to solve real-life problems. It may link other learning cells from other sources such as external information to form wisdom and information.

Enforcement and emphasis of knowledge prevents an essential active learning cell from becoming a non-active learning cell. Figure 6.0r illustrates the links between learning cells to emphasise learning and understanding of a subject matter. Learners can choose

various enforcement techniques from external information or other learning cells for emphasis on a subject matter.

5 New knowledge for learning is a necessary aspect in supporting a learner's learning journey. Figure 6.0s illustrates an example of the prompting of new knowledge from information from other learning cells. Diversifying and connecting information and training within a learning cell will allow the creation of knowledge to support individual needs.

10 Integration of the training DNA within learning cells, and other materials will form a unique learning organism and learning journey belonging to an individual. Learners will gain knowledge and the ability to perform a task through organized training, self-initiated learning, and experience in achieving it. In addition, learning organisms allow an individual to bookmark certain information, connecting it for a purpose and retrieving it.

15 Linking of information and the knowledgebase provides a rich and diversified learning neural network for the implementation of data analytics, machine learning to deep learning, providing valuable guidance or direction in making an informed decision in the learning and training arena.

20 Three basic categories of organisms formed are as an individual, in a group setting or at a country or geographical level.

Each unique individual is a living-learning organism. A learner will gain their knowledge and ability to perform a task through structured training, self-initiated learning, and
25 experience. In addition, learning organism builder will provide the facilities to allow an individual to bookmark certain information, connecting it for a purpose and retrieving it. The combination of Training DNA, learning cells, and the management of all the information provides a unique property of this organism within the learning space.

30 The segmentation of individual learning organisms within different industries, enterprises, or other ways will portray a diversified trend of training DNA and learning cells. Therefore, each of these groupings will result in a cloud of training DNAs and learning cells to address the general needs of the segment.

The geographical or regional landscape diversifies technology, agriculture and other characteristics. In parallel, it will also share similar requirements in terms of training needs. The systems provide an excellent opportunity to share, spur and share the best practice in training industries. From the datasets or analytics derived from the systems, it will also provide guidance or support direction to enhance each regional training policy or strategic needs.

One key advantage of the system is they allow the building of a knowledgebase based on personal to a more significant audience preference. Therefore, knowledge can be retrieved, enforced, renewed or even retired according to each unique Learner, organization, industry or society's needs.

Figure 6.0t shows an example of strategic planning analytics. Strategic planning with multi-level and dimension visualization of the critical consideration points enables a user to have an informed decision on setting up visions and goals, with the ability of appropriate adjustment to the plan. It links practical practice for problem solving, physical activities for job training and professional aspects which take into account relevant experience and knowledge.

Figure 6.0u illustrates a graph on innovative creation and time. The learning curve shows a growth trend from data analytics, to machine learning to deep learning. The system value will correlate positively with the dataset diversification, higher volume and complexity. Multi-level, multi-dimension and multi-connected learning neural networks provide rich datasets for data science technologies from data analytics, machine learning and deep learning to create a dynamic learning ecological system.

The present invention provides a method (700) for integrated learning and knowledge management to a user is further illustrated in Figure 7.0. The method comprises selecting a user environment comprising a course creator, trainers or learners which forms a front end of the integrated learning and knowledge management system (702), collecting a user's profile data in real time based on a user's experience and psychometric questions (704), collecting real time data of a user on learning behaviour and continual assessment metrics that provides an indication on the user's learning state (706), and further retrieving data on goals and aspirations of a user (708).

Next instructions are sent to the interfacing platform of the integrated learning and knowledge management system to select a learning management platform pathway or a knowledge management platform pathway (710). If the learning management platform pathway is selected, the scheduler is initiated to arrange a plurality of learning cells having a training DNA to form a learning journey for the user.

If the knowledge management platform pathway is selected the following steps will be taken as illustrated in Figure 4.0b. Figure 4.0b illustrates the flow of a module initiation within the knowledge management platform (122). A learner initiates the knowledge management platform by selecting a course (402). From the course, a content sub-module will be initiated from videos, audios, AR images, articles, text or documents, images, links or course contents received (404). The selected content can be bookmarked (406) into document or text, presentation, videos, assessment, voices and web links. The bookmarks will then be further organized to sub-modules such as examination, subjected related, for memorization, for refreshing, ad-hoc learning and archives (408). A learning retention sub-module will be initiated for personalized learning comprising emphasis, pattern mapping, recall, categories, recent contents, personalization and hybrid (410). The bookmarking will be reflected in a user interface (412) such as mobile device, laptop or PC, AR or VR device or holographic projection. External feedbacks based on bookmarking will then be received from an AI Career Path learning recommendation (416), an AI Driven Learning (414), Job Fulfilment requirement (420) and learner's profile (418) which provides information to a course recommendation module that will be proposed to a learner. Course recommendation (422) which may come in micro-learning form, course sub-module, full course or course bundling will recommend an appropriate course to a learner for selection.

Finally, one or more recommendation modules are selected from an artificial intelligence or machine learning platform which forms the back end platform where the recommendation modules (712).

Figure 8.0 is a method for automatically generating a training module for a specific student and for a specific key learning outcome. The method comprises the steps of determining a required learning pathway (802), selecting a series of learning cells with training DNA and other characteristics in order to facilitate that training module (804), including alternative and supplementary learning cells, so that a plurality of the learning

cells have a plurality of possible next learning cells, each learning cell including an assessment component, and responsive to that assessment component selecting the next learning cell for the training module (806), and repeating that process which each learning cell until the key learning outcome is determined to have been achieved (808).

5

The method further includes determining a required learning pathway of the learning cells comprises steps of depending on assessment components and user feedback.

10

Throughout this specification, unless the context requires otherwise, the word “comprise”, or variations such as “comprises” or “comprising”, will be understood to imply the inclusion of a stated step or element or integer or group of steps or elements or integers, but not the exclusion of any other step or element or integer or group of steps, elements or integers. Thus, in the context of this specification, the term “comprising” is used in an inclusive sense and thus should be understood as meaning “including principally, but not necessarily solely”.

15

CLAIMS

1. An integrated learning and knowledge management system (100) for providing a user with learning and training feedback for adaptive training, the system comprising:
 - a user environment platform (108) having a plurality of sub-modules on a type of user forming a front end interface (102)
 - an interfacing platform (110) which forms a middle platform (104), the interfacing platform (110) comprises:
 - a learning management platform (120) that recommends in demand knowledge areas or popular course to course creators for post lesson adaptation of a course design and takes into account popular learning theories and a combination of pedagogical, andragogical and heutagogical principles to refine recommendations for a user, and
 - a knowledge management platform (122) that retains knowledge accumulation, experience and learning habits of the user;
 - an artificial intelligence learning platform (112) which forms a back end platform (106) that receives instructions from the interfacing platform (110) which will be directed to a recommender system pathway;
 - wherein
 - the learning management platform comprises:
 - a scheduler sub-module comprising a plurality of learning cells that are active, semi-active or not-relevant arranged to form a learning journey to the user.
2. The integrated learning and knowledge management system (100) of claim 1, wherein the artificial intelligence learning platform (112) which forms a back end platform (106) that receives instructions from the interfacing platform (110) which will be directed to a recommender system pathway comprises:
 - a first recommendation module (202) providing a recommended path of short or full courses to a user, where the user is a learner, based on inputs from the user's profile, personal goals and prior training and knowledge;
 - a second recommendation module (204) providing a recommended path of course materials, resources and activities to a user, where the user is a learner,

based on inputs from continual assessments, learning behaviour metrics and the first recommendation module (202);

a third recommendation module (206) providing a recommended path of a knowledge management platform content of the user, where the user is a learner, and from other users based on the first recommendation module (202) and the second recommendation module (204);

a fourth recommendation module (208) providing a recommended path of adaptive learning based on inputs from the first recommendation module (202) and the second recommendation module (204);

a fifth recommendation module (210) providing a recommended path of training materials, resources and activities to a user, where the user is a trainer for adaptive improvements based on inputs from the second recommendation module (204);

a sixth recommendation module (212) providing a recommended path of training materials to a user, where the user is a trainer for lesson planning based on inputs from the second recommendation module (204) and the fifth recommendation module (210);

a seventh recommendation module (214) providing a recommended path of in-demand knowledge areas to course creators based on inputs from the first recommendation module (202), the second recommendation module (204) and the fifth recommendation module (210).

3. The integrated learning and knowledge management system (100) of claim 1, wherein the user environment platform (108) which forms a front end interface (102) comprises a plurality of sub-modules on a type of user, the sub-modules are a course creator (114), trainers (116) or learner (118).

4. The integrated learning and knowledge management system (100) of claim 1, wherein the scheduler sub-module comprises a plurality of learning cells that are active, semi-active or not-relevant arranged to form a learning journey that is unique to the user, each of the plurality of learning cells further comprising:

a training DNA for providing a course to the learner;

an activity module that initiates according to current known learning theories such as through a pedagogy or andragogy approach;

a material module that facilitates the activity module;

a tool module for providing a range of user experience that works in communication with the activity module and the material module;

an assessment probe module for providing feedback for evaluating a combination of activity module, a material module and a tool module to deliver an intended learning outcome within a learning cell.

5

5. The integrated learning and knowledge management system (100) of claim 4, wherein the learning cells are selected from a predetermined set of learning cells relevant to a key learning outcome, and the selection is adapted in response to one or more of preferences provided by the student, information about the prior experience and educational outcomes of the student, learning behavior metrics, and feedback or assessments in relation to one or more learning cells.

10

6. The integrated learning and knowledge management system (100) of claim 2, wherein the first recommendation module (202) providing a recommended path of short or full courses to a user, where the user is a learner, based on inputs from the user's profile, personal goals and prior training and knowledge comprises:

15

a pre-planned training course path module (230) based on a heutagogy learning process where the module receives information on learning outcome, generic skill competency and technical skill competency; and a customized course design based on achievement accomplished by the user.

20

7. The integrated learning and knowledge management system (100) of claim 2, wherein the second recommendation module (204) providing a recommended path of course materials, resources and activities to a user, where the user is a learner or a trainer, based on inputs from continual assessments, learning behaviour metrics and the first recommendation module (202) comprises:

25

a course design module where the trainer designs courses that support pedagogy, andragogy or heutagogy for the learner;

30

a course content module for addressing a content format for transferring training information to the learner;

an activity module that works in communication as a support to the course design module and the course content module comprising designs in different formats to suit a user's training need; and

35

a feedback module linked to the activity module that utilizes feedback tools.

8. The integrated learning and knowledge management system (100) of claim 7,
 5 wherein the course content module for addressing a content format for transferring training information to the learner, the content format is in the form of a power point presentation programme, videos, web links, text, augmented reality, AR, virtual reality, VR, gamification or holography.
- 10 9. The integrated learning and knowledge management system (100) of claim 7, wherein the feedback module linked to the activity module that utilizes feedback tools comprises feedback tools such as polling, text editing, mind map tools, annotation or interactive tools.
- 15 10. The integrated learning and knowledge management system (100) of claim 2, wherein the third recommendation module (206) providing a recommended path of a knowledge management platform content of the user, where the user is a learner, and from other users based on the first recommendation module (202) and the second recommendation module (204) comprises:
 20 a material or resource recommendation tool module that proposes study materials obtained from a knowledge base unit (216) to the user in assisting their learning process by providing material suggestions.
11. The integrated learning and knowledge management system (100) of claim 10,
 25 wherein the knowledge base unit (216) providing material suggestions comprises material sources from You tube, web-link or documents.
12. The integrated learning and knowledge management system (100) of claim 2,
 30 wherein the fourth recommendation module (208) providing a recommended path of adaptive learning based on inputs from the first recommendation module (202) and the second recommendation module (204) comprises:
 a career based course module for assisting a learner through effective and interactive recommendation to acquire skills for career development and goals.

13. The integrated learning and knowledge management system (100) of claim 2, wherein the fifth recommendation module (210) providing a recommended path of training materials, resources and activities to a user, where the user is a trainer for adaptive improvements based on inputs from the second recommendation module (204) comprises

a knowledge management module having a learning material storage and learning content book marking;

a course option module that recommends to the user a list of course options based on a human resource list, career path recommender or data available in the system;

a knowledge retention module for enabling a learner to organize or arrange information for retrieval according to a learner's learning needs where the learner is able to perform enforcement, ad-hoc type of revisions that aids in knowledge retention of the learner.

14. A method (700) for providing integrated learning and knowledge management to a user, the method comprising steps of:

selecting a user environment comprising a course creator, trainers or learners which forms a front end of an integrated learning and knowledge management system(702);

collecting a user's profile data in real time based on a user's experience and psychometric questions (704);

collecting real time data of a user on learning behaviour and continual assessment metrics that provides an indication on the user's learning state (706);

retrieving data on goals and aspirations of a user (708);

selecting a learning management platform pathway or a knowledge management platform pathway from an interfacing platform which forms a middle platform of the integrated learning and knowledge management system (710);

if the learning management platform pathway is selected,

initiating a scheduler to arrange a plurality of learning cells having a training DNA to form a learning journey for the user;

if the knowledge management platform pathway is selected,

selecting a course by the user (402);

initiating videos, audios, AR images, articles, text or documents, images, links or course contents received from the course (404)

5 book-marking selected contents (406) into document or text, presentation, videos, assessment, voices and web links;

organizing the bookmarked contents to sub-modules such as examination, subjected related, for memorization, for refreshing, ad-hoc learning and archives (408);

10 initiating a learning retention sub-module for personalized learning comprising emphasis, pattern mapping, recall, categories, recent contents, personalization and hybrid (410);

15 reflecting the bookmarked contents in a user interface (412) such as mobile device, laptop or PC, AR or VR device or holographic projection;

receiving external feedbacks based on the bookmarked content from an AI Career Path learning recommendation (416), an AI Driven Learning (414), Job Fulfilment requirement (420) and learner's profile (418) which provides information in course recommendation to a learner;

20 recommending of courses to a user (422) in micro-learning form, course sub-module, full course or course bundling for selection;

selecting one or more recommendation modules from an artificial intelligence or machine learning platform which forms the back end platform where the recommendation modules (712).

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15. A method for automatically generating a training module for a specific student and for a specific key learning outcome, comprising the steps of

determining a required learning pathway (802),

selecting a series of learning cells with training DNA and other characteristics in order to facilitate the training module (804),

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including alternative and supplementary learning cells, so that a plurality of the learning cells have a plurality of possible next learning cells, each learning cell including an assessment component, and responsive to that assessment component selecting a next learning cell for the training module (806), and
5 repeating steps (802), (804) & (806) with each learning cell until the key learning outcome is determined to have been achieved (808).

16. A method according to claim 15, wherein determining a required learning
10 pathway of the learning cells comprises steps of depending on assessment components and user feedback.