

## Build Your Path With Smart Skill Map.

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### ABSTRACT

As industries and technologies evolve more swiftly than ever before, the need for a workforce that continuously learns and develops new skills is greater than it has ever been. The "Smart Skill Map" project aims to provide a revolutionary way for an individual to identify, learn, then monitor what they deem important skills for future employment. Due to its use of artificial intelligence and a data-informed, user-focused understanding of the user's interests, skills that are already possessed by the user, and the user's career targets, this project develops a truly personalized learning pathway. By putting together available online courses, certifications, and professional connections to follow, the Smart Skill Map will lay out the knowledge and skills that a user should be working towards. More so, the Smart Skill Map provides a framework to follow that would be specific to a user's professional context. Ultimately, this will give someone the ability to plan their own development of skills and eventually, their employment, while addressing the skill shortfalls that seem very common in a profession or in an industry. This proposed learning system will focus on improving an individual's use of their knowledge and skills and ultimately help learners to evolve and learn the skills necessary for a job market of the future - one that will be continually evolving...

**Keywords:** Career Path planning, Personalized Learning, Adaptive learning, Professional growth, Future of work, Learning Experience Design

### 1. INTRODUCTION:

In the modern professional landscape, success is defined less by hard work as it is in working smarter. Anyone from a student to someone who has recently graduated to an established professional who wants to make a shift or grow, will need a clear path related to skills. This is where the smart skill map emerges. It assists you in defining a visual of your skills today, identify the gaps, and strategically plan your learning to accommodate your career path. Think of it as your personal GPS method for career development. Like your GPS directs you the best route or alternatives and real updates so a smart skill map helps to determine where you are, where do I want to go, and how do I get there in the best possible way. Through the completion of the smart skill map it brings clarity to the gap of today's skills to goals of the future through a structured and data driven way of identifying, building and tracking competencies. The conventional methodology of skills development appears often disjointed and fragmented. In many cases, people take random classes, participate in conferences, and experiment with multiple tools; leaving them clueless as

to whether it is, in fact, moving them toward their "end game." The waste in time, money, and energy can be significant. A skill map that is "smart" removes the element of chance in your skills development journey, so you can freely map your skills development to your personal and professional aspirations (e.g., preparing to transition to leadership, learning a new technology, or becoming a subject matter expert in your field). Developing a "smart" skill begins with self-discovery. You need to objectively assess your current skill set, both technical and soft skills, in comparison to where you aspire to build your career (in "management" or "leadership," for example). Next, you must conduct research: what does the role or industry you are targeting necessitate, what type of certification, experiences, or tools are expectant? By doing the "comparison," you will clearly identify the critical gaps before building your roadmap, designing short and long-term learning goals with clear milestones. The process by which it becomes "smart" is providing integrated tools, data, and personalization. Smart skill mapping will often employ AI-powered platforms, career analytical tools, or skill assessment tools that advise based on the job landscape,

job descriptions, and industry regulations to impart wisdom (Rubel, 2021). Such tools about new resources, track, and provide support for your progress, and provide new opportunities based on your rapidly evolving skills. In terms of an example, the learning process becomes more dynamic, adaptive, or fast, and efficient. Furthermore, a smart skill map is not static in its future iteration. You will evolve in your career, and with industries evolving, your skill map, as a tool, will need to be refreshed and updated. This is valuable if you want to maintain the relevance and competitiveness of your skill set when challenged with new opportunities. Furthermore, refreshing your skill map continuously contributes to a culture of continual learning; this is essential for your learning in our current knowledge economy. Conclusively, creating your own way by using a smart skill map provides you with power, agency and control to design and scaffold your personal development. It supports the translation of vague aspirations into actionable strategies and opportunities, and it creates reflective focus, intentionality, and future- readiness.

## 2. LITERATURE SURVEY

In recent years, there has been increased interest in personalized learning systems, particularly with the advent of skill-based education and workforce upskilling. The Smart Skill Map project seeks to fill a major gap in personalized career development by developing a data-driven, adaptive map for individuals who are looking to develop their skills as they grow in their careers. Due to the accelerating pace of change in the workplace, skill durability is diminishing. Conventional modes of learning and skill development do not generally meet user's needs for staying current. Thus, Smart Skill Maps (SSMs) are emerging as new tools in individualized learning and career development. An SSM is an intelligent, often AI-based, tool that maps an individual's existing skills, identifies gaps in skills, and provides personalized skill development recommendations to fill the gaps. SSMs will facilitate individuals more quickly developing skills, as well as supporting individual learning in alignment with evolving trends within a career or industry.

### Personalized Learning Systems and Career Pathway Models

As their intent is similar (to help people navigate learning or training toward careers), there are some works that intersect both: Systems not only personalize the learning path at the course/module level but also connect to career pathways, e.g., by mapping important competencies needed for the jobs of interest, and recommending sequential learning experiences specifically for that individual learner. Predictive analytics/ML to predict career paths (i.e., who obtains what career where skill/training is to certain degrees). In this case it allows for feeding in CPM to pathways design. It fits the idea of closer likelihood to predicting a career path. Intelligent career planning systems (e.g., "On-demand, individualized career planning of college students using adaptive artificial intelligence,") describe systems that are using data on the individual student, and suggesting adaptive career related learning steps. As noted by [1], personalized learning utilizes data to adapt learning

content to each learner's traits in a given context. These examples frequently include skill assessments and predictors to assist potential users in understanding the skills they should work on, as discussed by S. Kumar et al. [2], when these authors mention adaptive learning technology helps personalize a more robust learning experience. The adaptive learning technology continuously adapts to a learner's learning progress and provides customized recommendations to maximize the learning experience.

### Concept and Architecture of Smart Skill Maps

Smart Skill Maps are more than a list of skills, qualifications, and proficiencies. They illustrate skills, often visually, and allow flexibility in representing the current gap while providing suggestions for personalized learning pathways. Guszczka et al. [1] define a SSM as a decision-support system that combines human judgment and machine intelligence. SSM systems generally consist of the following components:

*Skill Extraction Engine* - Skill extraction engines employ Natural Language Processing (NLP) to process resumes, job descriptions, and other text-based data for identification of skills.

*Skill Ontology and Taxonomy*- Skill ontologies and taxonomies are organized structures for skills and/or knowledge, such as ESCO (European Skills, Competences, Qualifications and Occupations) or O\*NET, that provide a standardized framework to map skills.

*Gap Analysis Module*- A gap analysis module outputs the variance in skills between the current threshold and desired threshold. Recommendation System. A recommendation system provides suggestions for learning resources based on individual objectives and status of skills.

### Skill Mapping and Career Development

The concept of skill mapping for career development is explored in [3], where various techniques for mapping existing skill sets against job market demands are examined. The job environment is evolving very fast and one has to be able to evaluate one self and keep learning new competencies. J. Smith et al. [4] study showed the methods of using skill-based algorithms through online platforms to propose suitable courses and certifications, e.g. LinkedIn and Coursera. These platforms have enabled the gap between education and the skills required in the industry, thereby aiding in the professional growth and career development. Professional learning has also shifted to be a dynamic process, which requires lifelong learning and development. In this context, skill mapping is a useful tool as it provides a graphical illustration of the position one currently holds in his/her career, and the education that one must achieve in order to attain the desired destination in his/her career. Skill mapping allows a learner to take control of his or her career development because it consumes conscious, mutually agreed actions on the learning priority point and with the movement of career priorities. In the case of organizations, skill mapping incorporates the organizational strategy in talent management and recruitment, training and development,

and succession planning. Skill mapping is also an organization tool to establish the potential employees with high capabilities and match the skills associated with developing learning and the business requirements.

### **AI and Data-Driven Skill Development Platforms**

Machine learning and artificial intelligence are a paradigm shift in developing a skill set. A. Lee et al. explored the idea of AI in adaptive learning systems in the context of education. Working within the parameters of machine learning, a platform could use large datasets detailing a user's past behaviors, preferences, and progress towards a skill to offer meaningful recommendations for a personalized learning path [5]. An AI-driven adaptive learning system facilitates dissolution of the traditional concept of learning pacing. Instead of static learning, the platform objectively and continuously adapts recommendations for each learner, considering their evolving skills. The other benefit is scalability - allowing a very large population of learners to use the system, from students to working professionals. While there is great promise for AI and data-driven skill development platforms, there are also many challenges to overcome in order to successfully unlock that promise. First and foremost, data privacy and security is a top-of-mind issue, as these platforms must ask learners to provide and analyze large amounts of personally identifiable and performance-based data. Information must be gathered in an ethical way, and learners must be given information about the ways the data is used, informed consent to security and engagement protocols. Bias in the training data can also cause even more inequities than previously noted including the underrepresentation of already marginalized people or perpetuating stereotypes. Developers must also meet the charge of fairness and transparency in their approaches to building approaches of explainable AI that inform users about how their data is used in AI recommendations

### **Gamification and Motivation in Skill Learning**

M. K. Gupta et al. [6] conducted research on gamification and its use in motivating learners, specifically addressing game-like components including achievements, tracking progress, and visualizing development of skills, in part, leading to enhanced engagement and increased drive. When skill development is framed as career development, the interaction and reward from skill acquisition can also make the experience more enjoyable through gamification. Gamified activities as part of a skill map system can be beneficial to encourage a user's skill acquisition and retention and also make pathways for learning more interactive. While traditional skill acquisition approaches often do not motivate the learner to engage in practice of new skill, through the use of either repetitive drills, with complex concepts, or long-term training goals. Gamification addresses each of these issues through manipulating forms of both extrinsic and intrinsic motivation to engage in the learning process in an experience that is challenging but does not cause discomfort to the learner. Intrinsic motivation can be developed from enjoying the experience of learning, while extrinsic motivation can come from recognition or reward for engaging in the experience. The process of

gamification encouraged both intrinsic and extrinsic motivation to create an overall motivating experience. Gamification raises the motivation for the learner through features that are seen in gamified experiences, such as immediate and ongoing feedback provided to the learner. In gaming-like features, the motivation for the learner comes from features like progress bars, levels, and points that shows the learner their progress thus far and motivates them to progress to the next level.

### **Industry-Specific Skill Gap Analysis**

As indicated by D. Brown et al. [7], every industry will have its own differences regarding skill gaps, and this understanding is necessary for effective skill development programs. The tech industry seeks proficiency in such areas as AI, data science, and cybersecurity emerging technologies. The health industry seeks specialized knowledge regarding patient care and medical technology. By including industry-specific data in the Smart Skill Map system, users will be able to customize their learning path related to the field they aspire to work in. The notion of skill gap analysis emerged as a tool for workforce planning and human resource development that has become more relevant due to the pace of technological change, globalization, and market trends. Across industries, skill gaps are not uniform and vary based on the industry, the operations of each industry, regulation, innovation cycles, and competition. For example, the manufacturing sector may have an increasing demand for technical skills associated with automation and robotics, while the health sector will increasingly require clinical skills specific to the occupation and digital literacy. Thus, a general approach to skill gap analysis will most likely not be effective, whereas an industry-specific frameworks approach that embraces the detail of the sector and its evolving skills demand, are considered best practice. We typically think of industry-specific skill gap analysis starting with an extensive discovery of the current skills of the workforce and assessing this against the type of skills the industry now requires and will require. For discovery you will generally use a combination of methods that include employee surveys, employer interviews, labor market analysis, job advertisements, industry reports and other types of data.

### **Challenges in Skill Mapping and Personalized Learning**

*Employment sectors* - skill mapping and personalized learning are increasing as essential means of matching the individual learner's abilities and capabilities with both educational and career pathways.

*Skill mapping* - The deliberate identification of and structuring of a person's skills and ability - normally framed within jobs

*Learning experiences* - in relation to their future job/career goals. Personalized learning is when learning content and experiences are developed based on the learner's individual needs, preferences, goals, and progress. These systems often overlap within educational technology (EdTech) systems or workforce development platforms.

*Education technology* - In both fields, there are substantial challenges impacting scale, accuracy, fairness, and ethical use of skill mapping and personalized learning.

*Despite progress* -Nonetheless, there are still issues in designing effective and scalable systems of skill mapping. A. According to Johnson et al. [8], obstacles include the privacy of data, their availability and the uncertainties about the actual abilities of users.

*Learning path*- Fluidity of job roles is a requirement that demands a response in the form of the fact that this type of the system needs to be flexible and this objective can be accomplished by incorporating continuous feedback and real-time data into the models of learning paths.

*Self-reporting* - This is a major issue that skill mapping and individualized learning systems must address in terms of data quality and validity. Most of the systems rely on information gathered through self-reporting, or polls, or platform activity metrics that are either out-of-date, partisan, or incomplete.

*Information overload* - An example is that can lead to a situation in which learners would overestimate or underestimate their competencies, particularly when such an assessment is the only or the most important fact about their competencies.

*Adapting to change* -The second problem is that data is frequently siloed; that skill data can be stored in many different systems (LMS, HRIS, manual tools) that are not interconnected and this makes the real-time use more difficult and limiting. The data silos might also not be updated on a regular basis- resulting in the old suggested skills and competencies which are no longer applicable either in terms of industry demands or learner settings.

*Absence of mentorship*- A second major problem is that there are no standardized taxonomies and definitions concerning skills. There is much inconsistency between sectors and educational institutions regarding nomenclature, definition and structure of skills. As one example, the skill of project management, might refer to a set of skills that is diverse in the field of IT relative to other areas, such as healthcare or education. Soft skills, like leadership or communication skills are hard to classify, as they are, by definition, subjective and situational. Moreover, emerging areas, including AI, data science, or cybersecurity, create new skills that have not been recorded so far in a standardized manner.

*skill taxonomy in general*- Pushing platforms off-hand to determine or give relevant suggestions on these skills. In absence of a stringent and shared set of definitions used to describe skills, skill-mapping applications would not produce an apt norm or transferable profile.

*Following the climb* - In the reviewed literature, the growing need in personalized and skills development solutions is emphasized, and the importance of using the concept of artificial intelligence, data analytics and gamification to create personalized learning opportunities is noted. The suggested Smart Skill Map will develop the investigations, offering the comprehensive, dynamic system with the purpose to offer the skills, which may be learned by people, planning their career courses/tracks.

### 3. PROBLEM STATEMENT AND OBJECTIVES

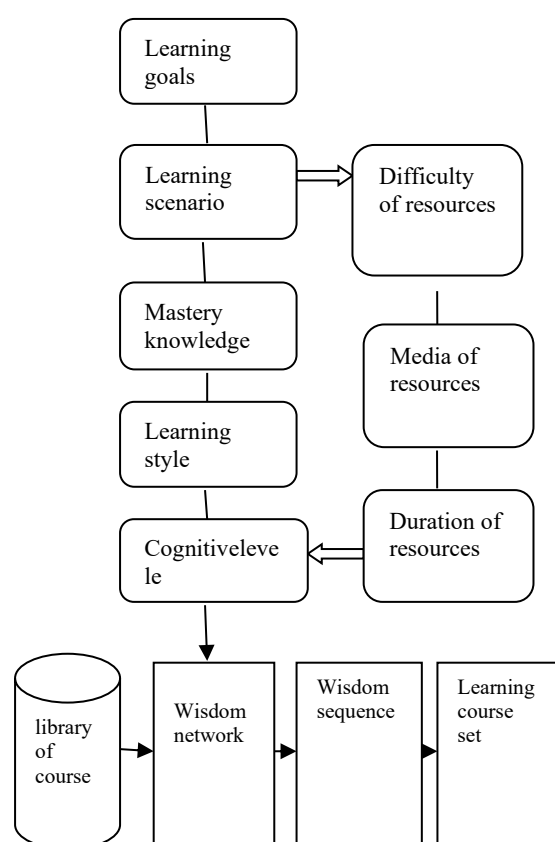
#### Problem Statement

The nature of work is changing rapidly with technology, globalization, and societal needs. With all the change, there is a challenge that stands out relating to the complex number of skills required to participate in the modern workforce. The number of skills required can feel endless both technical and soft skills. Technical skills include areas like data analysis, machine learning, and coding. Soft skills vary and include items like leadership, communication, emotional intelligence. Now adding to the burden of all these skills, is the decision regarding where to start, what is most critical to learn, and how to systematically measure your progress. When people don't have a systematic plan of learning competencies, they often are left with too many commitments in all areas of learning or ultimately decide to learn a competency that may not be in their best interest or market need, or even may not be the most developed competence. As well, traditional careers are no longer exclusively linear in nature. Numerous professionals change jobs and/or careers, or even change industries, sometimes all three. You have learning platforms, courses, books, and even mentors for any aspect of career development. With so many options available, it can be nearly impossible to figure out what resource or development strategy will help you develop skills. When all of these resources or learning platforms out there do not use a specific framework or learning development process, you can waste time and energy with resources that may be less effective or irrelevant to what you are trying to learn, which can breed frustration and burnout. This issue impacts people who want to enter or transition to different roles at a time when knowing how to build a skill set to support that movement feels more important than ever. People may potentially find themselves with an experience gap in the transferable skills needed in that role, and there will be no prompt to build one based on what is obviously happening to them in the work environment. When being agile and continuous learning is valued now more than ever, being stuck trying to define the skill to build will create a barrier in growth and potential.

#### Objectives

A smart skill map is a structured, personalized tool that enables you to identify, evaluate, and develop the skills you need to achieve your aims. You will use a smart skill map as both a map and compass that directs you where you ultimately want to go and keeps you in an ethical range of where you want to go. When you begin to create a smart skills map, the first step you must take is baseline assessment. This will include a self-assessment activity to create a better picture of yourself, your skills, the risks you will take, and the opportunities that have presented themselves for you. You can start this cognitive process by coming up with a brainstorming session regarding your wins and accomplishments in your current position, what you have enjoyed and accomplished as a worker, or you may even want to ask peers, mentors, or a manager about what they would identify as your skills. Once you gather your baseline skills you occupy in the labour market, you can begin to brainstorm about ideas of important skills you need to grow in next. Again, those skills may be

technical (such as programming, data analysis, project management, etc.) or softer type skills (such as communication, leadership, emotional intelligence, and such). A smart skill map is a dynamic document that changes throughout your career. Each time you work toward a new goal and look to achieve a new position, your mapping should be updated to respond to demands, challenges, and opportunities. A skill map developed for a transition into a leadership position may prioritize your development of skills associated with strategic thinking, team management, and decision making. A skill map intended for a transition into a new industry may focus solely on knowledge related to an industry, along with technical skills for that industry. In the end, creating your journey with an intelligent skill map is about acting on your learning and developing skills and your career. It makes an often-difficult task of learning skills and gaining capabilities feel more manageable and purposeful. By building a customized skill map, you're emboldened to drive your career, adapt to changes, and progress daily toward your professional goals. The interface for "Build Your Path with Smart Skill Map" is designed to be an all-in-one, user-friendly tool to grant individuals proactively control of their development personally/professionally. The main feature of the interface is the user-centred dashboard that displays a time-stamped snapshot of an individual's skill profile - current skills/competencies, progress toward their career goals, as well as a curated set of next steps/learning resources provided by the AI.



#### 4. PROPOSED INTERFACE

The dashboard is clean, intuitive, and informative and, provided the individual regularly assesses their

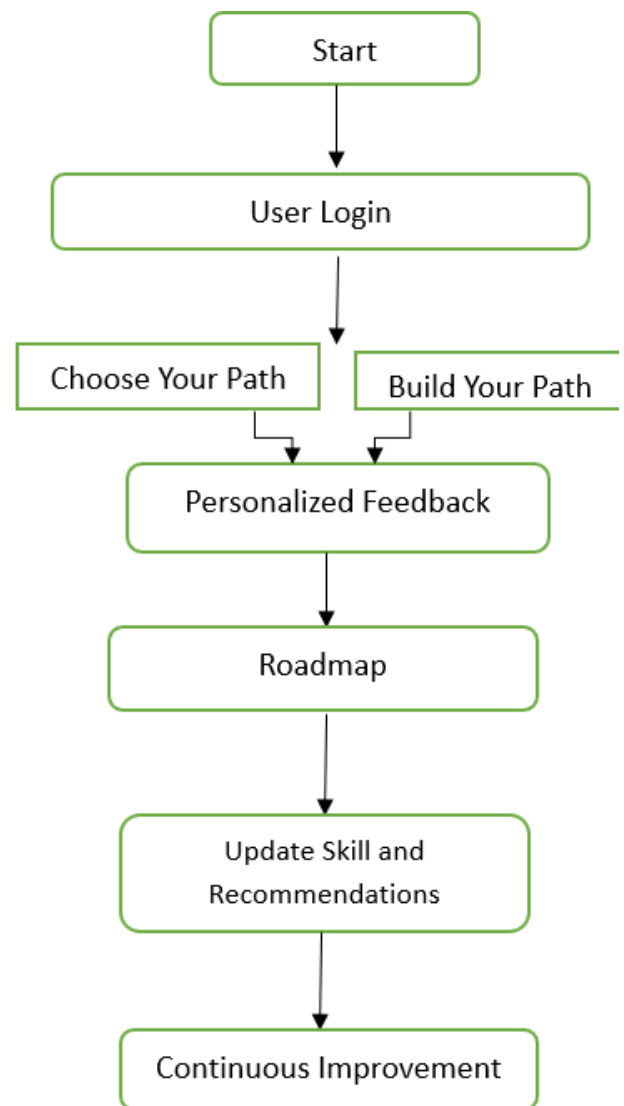
capabilities, including a variety of visual tools available to them. These include a skill progress graph, a goal tracker, and a notifications feature that continually engages attention. The Skill Assessment component is made up of the main modules, enabling users to determine their skills that they have, through self-assessment surveys, short interactive quiz experiences, and/or by uploading their resumes and LinkedIn profiles, which the tool will use to automatically capture (what knowledge, skills and/or experiences they already have) and determine proficiency levels. In this way, the tool can record known skills and assess levels of proficiency for each. Once the skills related to the user are captured, the Smart Skill Map serves as the central visual tool. In this visual experience, the user can see their skills organized into clusters, such as technical skills, soft skills and leadership skills, in a colorful, interactive map. The Smart Skill Map also restates the target skills related to a personalized career choice, while visually indicating the skills that are missing, i.e. the skill gaps. Visual lines are drawn from current skills to target skills indicating progress across a customized learning pathway. The user can click on a skill to enter a detail view that provides a definition of the skill, its relevance in the industry, the current level of attainment for the skill, and a curated set of learning resources, (e.g. courses, articles, practice projects...) with a calculated time to complete (the learning resources). The Career Pathway Selector empowers users to select job roles or fields of interest, including digital marketing, data science, and software engineering. After selecting a targeted role, the platform reveals the required skills for that particular role and juxtaposes those skills to the user's profile, automatically creating a skill gap analysis after the previous evaluation. Using the skill gap analysis, the system generates a personalized roadmap that offers recommendations about which skills to build, and then suggests the learning pathway for users to pursue in order to build that skill. The Learning Hub contextualizes that action by integrating with major e-learning platforms such as Coursera, Udemy, edX, among others. Users can then filter the recommended resources based on ease of understanding, duration, certification, and other things, and even bookmark and follow their progress through a course completion, and receive recommendations based on progress offers a seamless learning experience. The platform also contains a Goal and Milestone Planner, which enables users to develop SMART goal (Specific, Measurable, Attainable, Relevant, Timeliness) related to either skill development and acquisition, or their career development journey. This planner also includes a visual timeline, calendar functionality and progress tracking, which incentivizes students with badges earned for achieving milestones. The platform has a built-in Feedback and Reflection Journal that permits users to capture what they learnt, applied (and plan to apply), and their next steps towards an engaged and self-aware individual.

The overall layout of the platform maintains a modern and responsive feel with the compatibility for mobile, tablet and desktop. It also incorporated light and dark mode for comfort, as well as drag-and-drop functionality for customizing the ordering of the skill map. The site is further meant to be user-friendly to everyone. Overall, the

entire interface will be oriented towards providing the person who has decided to create his/her path to the career success with clarity, structure and confidence.

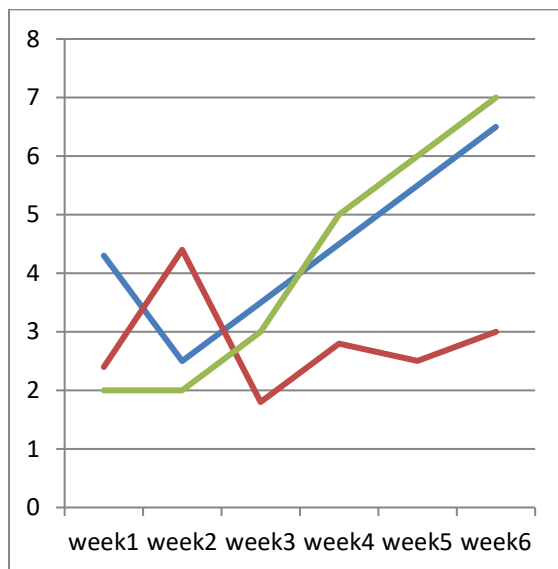
## 5. RESULT AND ANALYSIS

| Aspect                          | Smart skill Path  | Career Path Recommender   |
|---------------------------------|---|---|
| <b>Projectapproach</b>          | Dual-mode: "Choose Your Path" or "Build Your Skill".                    | Single-mode: Recommends career based on interests/skills        |
| <b>UserInvolvement</b>          | Highly interactive — users take tests, get feedback, and track progress | Less interactive — users input data and receive recommendations |
| <b>SkillAssessment</b>          | Skills are tested with questions, and users receive detailed feedback   | Skills are self-reported or inferred from interests             |
| <b>Feedback System</b>          | Personalized feedback after each test with learning suggestions         | Minimal or no feedback — just suggestions                       |
| <b>Learning Recommendations</b> | Courses and materials recommended based on test results                 | Usually doesn't include direct learning path suggestions        |
| <b>Target Users</b>             | High school/college students, upskillers, job seekers                   | Mostly students choosing future careers                         |
| <b>Real-World Application</b>   | Can guide learning and job preparation effectively                      | Useful for initial career exploration only                      |



## 6. CONCLUSION

The success in the modern society is much dependent on how we react to situations rather than just what we are aware of. A Smart Skill Map offers and gives a deliberate structure to the process of becoming ourselves and becoming successful by defining the skills we all should be applying to reach our various life and work situations. When we can name, rank and set goals on what we need to be developing, it will be possible to see the way forward. Our Smart Skill Map does not only equipped in academic development, work in action, but also encourages deliberate learning strategy, and continuous improvement, and encourages skill development, and relevance and need today and what we will need tomorrow. The Smart Skill Map helps us build the strength and adaptability that is required of us in the ever-growing changing world. The Smart Skill Map helps individuals to own their own development journey so that we are purposeful and rooted in the skill sets that are aligned to enrich our life and career success. Smart Skill Map is not merely a road that allows one to follow to improve their career, but instead an ongoing lifelong learning and growth strategy.



Ultimately, to be involved or engaging with a Smart Skill Map is to commit with full intent to the pathway of new opportunity, yet also be flexible, with greater self-awareness. In this way, we can not only develop the attitudes, capabilities and competencies needed for a thriving work life, but we can also create the mindset and skillsets to thrive in a rapidly changing work life.

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