
Curtin University
FUTURE OF WORK INSTITUTE
MAPNet
Rethinking Work Skills for the Future
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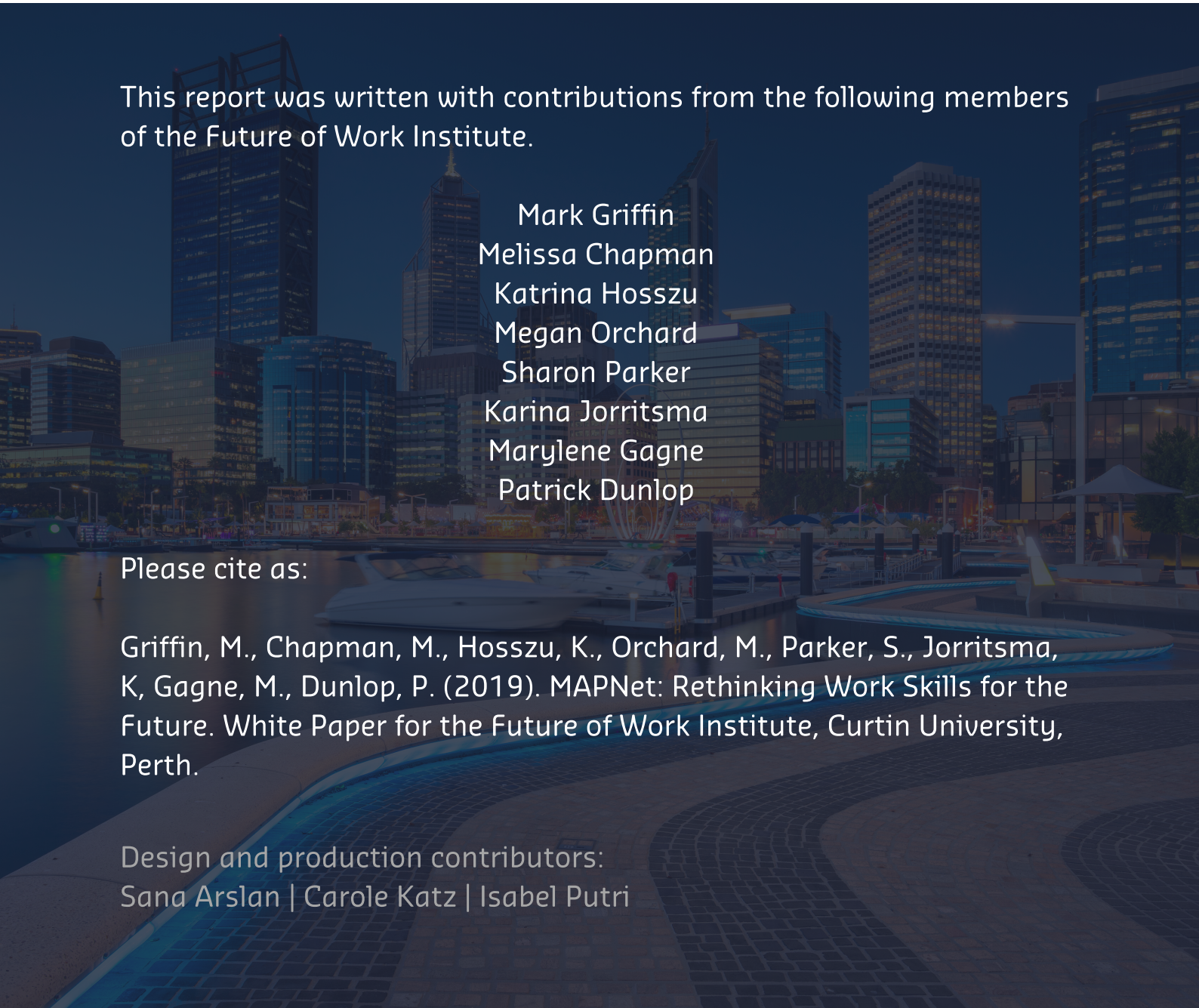
# The Future of Work Institute

Everyone benefits from work that is meaningful and productive. In a time of frequent transition, the Future of Work Institute seeks to understand and improve work.
We partner with groups and organisations from all sectors to implement, evaluate, and support change.

# Our Mission

Our mission is to support thriving people and organisations in the digital age.



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Please cite as:

Griffin, M., Chapman, M., Hosszu, K., Orchard, M., Parker, S., Jorritsma, K, Gagne, M., Dunlop, P. (2019). MAPNet: Rethinking Work Skills for the Future. White Paper for the Future of Work Institute, Curtin University, Perth.

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# CONTENTS

"Interdependence has without doubt brought in much more uncertainty...The sheer scale of events piling one on top of the other is making business keener to anticipate and respond effectively to the unexpected."

(Syrett & Devine, 2013, p.15) [1]

# PART ONE

# INTRODUCTION

The changing nature of work is of growing interest for employers and employees alike.

People worry about how their job will change, their opportunities for meaningful work, and if they will have a job at all. These concerns are understandable. The world is facing unprecedented environmental, social, and economic challenges, with knowledge and technological change growing exponentially[2, 3].

Innovation, automation, big data, and demographic changes, and more, are leading to substantial disruption across all industry sectors[3].

Pessimists describe a future where machines replace human capability and inequality is magnified. But the negative case is overstated: historical precedent and untapped human potential speak to growing possibilities across broad sections of our society.

Nevertheless, there is a clear risk that these possibilities will not be realised without a better understanding of future work skills and how these skills can be developed.

To explore future possibilities, we outline a new way of thinking about job requirements and work tasks. We first define two fundamental challenges for modern work.

First, work happens in an increasingly *uncertain* world of rapid, unpredictable, and mostly sustained change. Second, work is increasingly *interdependent* with people more tightly connected to other people, as well as technology, through teams, networks, and interconnected systems.

We introduce the MAPNet approach to explain the deep structure of work tasks. The MAPNet approach allows organisations to identify the multitude of skills and activities that are fundamental for enabling success in uncertain and interdependent work environments. Using the MAPNet Framework, we identify how key skills can be developed and supported for organisational success in the future of work.

The challenges of uncertainty and interdependence are not new. However, the impending scale and urgency of these challenges means that traditional organisational ways of meeting them will be inadequate. We need a new way of thinking about how work is organised in an uncertain and interdependent world. In this paper, we explore ways to re-think the organisation of work and identify the skills that will be required to successfully navigate a dynamic future.

The next section explores MAPNet and its applications. Part 3 details comparisons of key skills frameworks and Parts 4 to 6 provide background information about skill development, the drivers of change and reviews the key skills that have been the focus of policy makers, educators, and researchers.

# PART TWO

## MAPNet: THE DEEP STRUCTURE OF WORK

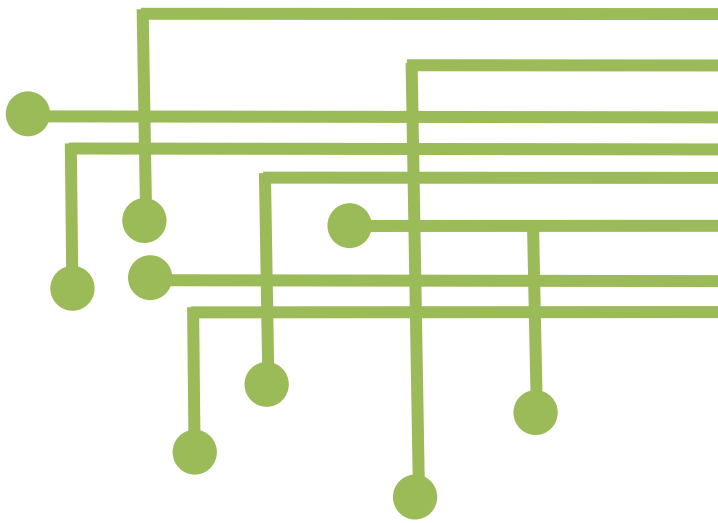
Organisations have to manage an immense variety of work activities to continue a profitable existence. Skill requirements can range from specialised skills needing formal qualification (e.g., medical skills in a hospital) to more general skills that apply across the workplace (e.g., communicating clearly to customers or colleagues).

Mapping the full domain of skills is challenging, and organisations regularly reclassify and categorise them into new competency frameworks, skill taxonomies, and ability requirements.

The MAPNet framework provides a new way of thinking about skills based on the deep structure of work. The deep structure classifies activities based on two fundamental mechanisms through which organisations achieve goals: (1) optimising uncertainty and (2) optimising interdependence.

It can then be asked more specifically how individuals contribute to these two purposes of uncertainty and connectedness. Examples of specific questions we can answer are:
-What activities do workers undertake?
-What skills and abilities are useful?
- How will these requirements change in the future?

We outline the nature and importance of the deep structure in the next section. We then explain how this structure is especially relevant to the changing nature of work, and how using the MAPNet framework* enables us to think differently about future work skills.



*The MAPNet Framework is based on the model of work role performance work by Griffin, Neal & Parker (2007)[4].

# UNCERTAINTY AND CONNECTEDNESS

Organisations are purposeful and achieve goals that individuals could not reach by acting alone. The most fundamental organisational processes involve addressing uncertainty and interconnectedness, which together represent the deep structure of work.

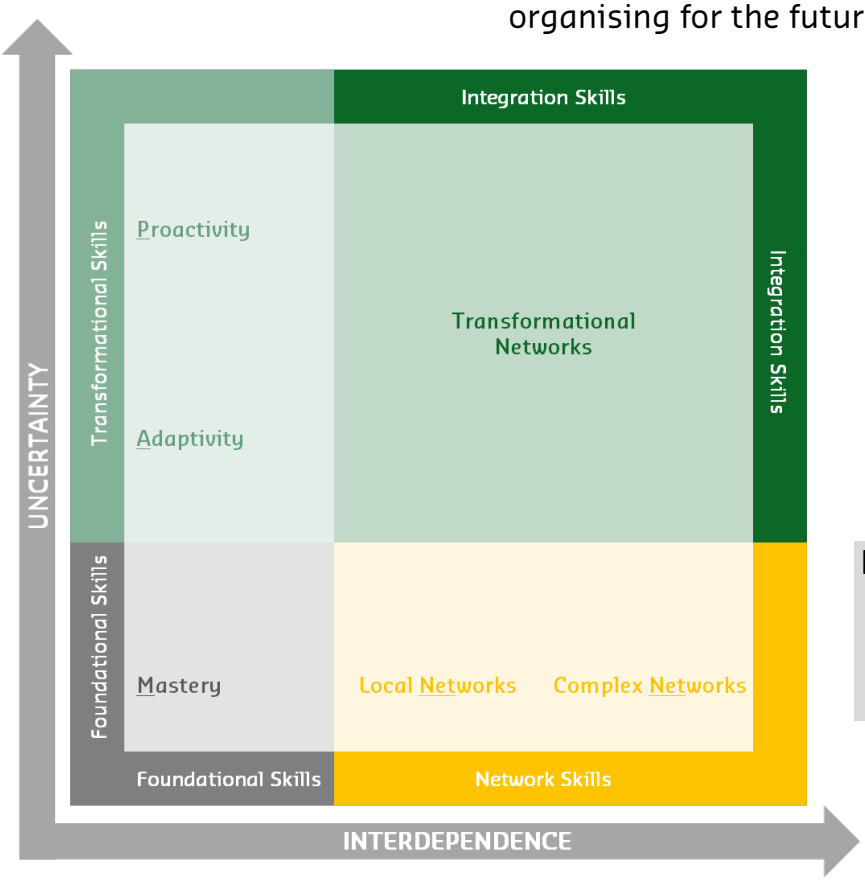
There are two main ways organisations undertake the deep structure of organising.

First, organisations bring order to the uncertainty arising from unpredictable and complex events. Traditionally, this order has been by revising the organisation's vision, then aligning the strategy to the vision. This is followed by specifying roles and tasks that provide forms of control, which can be used to ensure goal attainment via compliance.

The current rate of change demands a new way of managing uncertainty, as traditional processes are not able to keep up.

Second, organisations connect and coordinate, providing predictability in the face of interdependent networks among people and technology. Organisational strategy, roles, procedures, goals, and practices all align and function to ensure that the operation and outputs are predictable over short and long-term timeframes.

Organising by attempting to bring order to uncertainty and predictability in interdependent networks is becoming more and more difficult in modern work. Instead, we argue that optimising uncertainty and interconnectedness is a more effective approach to organising for the future of work.




Key elements of the MAPNet framework

# WORKING IN AN UNPREDICTABLE WORLD: OPTIMISING UNCERTAINTY

At first glance, the notion of optimising uncertainty seems counterintuitive. Traditionally, when scholars and practitioners discuss ways of "managing" uncertainty they invariably mean reducing uncertainty. Through this lens, an organisation's strategy creates a common direction in the face of environmental uncertainty. Procedures, rules, and control systems that flow from the strategy then ensure adequate levels of predictability and reliability.

In a rapidly changing world, this traditional way of managing and reducing uncertainty is no longer enough to achieve organisational goals. Simply put, the world does not stand still while we implement strategies to manage uncertainty.

The MAPNet notion of optimising uncertainty challenges traditional management approaches that focus on reducing uncertainty.

Instead, optimising uncertainty means that there can be good reasons to engage positively with uncertainty, even to generate uncertainty. In fact, many of the skills required for success require individuals to generate more uncertainty, whether for themselves, co-workers, or customers.

Generating uncertainty does not mean strategy is discarded, but acknowledges uncertainty and embraces it as a potential catalyst for innovation. For example, releasing internal data beyond traditional users can lead to new insights from different perspectives. Alternatively, organisations taking risks by entering new markets can generate uncertainty about outcomes but also lead to new revenue streams and greater success.

# WORKING IN A CONNECTED WORLD: OPTIMISING INTERDEPENDENCE

Technology is rapidly changing the possibilities for human communication. New ways of interacting and coordinating are redefining the dependencies among people, machines, and tasks. Within the space of one generation, we have moved from landlines and fax machines to virtual assistants and wearable technologies. Technology now pervades human experience in less visible and more intrinsic ways.

Traditionally, teams working in the same location managed an organisation's interdependent tasks. Communication technology is now widespread and project teams networked across multiple locations are replacing co-located teams working in divisional structures. The use of multidisciplinary teams helps address and optimise interdependence (and uncertainty) by offering the ability to look at issues from differing dimensions with the opportunity for a richer solution.

Already, people are using technology every day, both in their personal and working lives to augment themselves. For example, pilots use flight instruments in addition to their own cognitions to fly safely and improve their situational awareness.

However, the future of work will involve a move from the use of more passive, human controlled technology, which is used as a tool, to a more active technology, viewed as a team member: artificial intelligence (AI).

An increase in the integration of AI in the future workplace will also call for a re-think on how to optimise the more complex interdependence between the 'thinking' human and the 'thinking' technology.

As organisations continue to adopt more autonomous technology, the relationship between humans and intelligent technology will become increasingly dynamic and change the way work is completed.

Finding optimal levels of interdependence between combinations of human-technology teams will allow the fusion of human and technology strengths to enable a workforce that is greater than its parts.

Using the MAPNet framework enables us to think differently about the deep structure of work and examine future work skills in light of the two major organisational challenges; working in an unpredictable world and working in a connected world.

By examining these organisational challenges in combination, the MAPNet framework allows us to identify the variety of skills and activities that enable success in uncertain and interdependent work environments, discussed next.

# MAPNet SKILLS: OVERVIEW

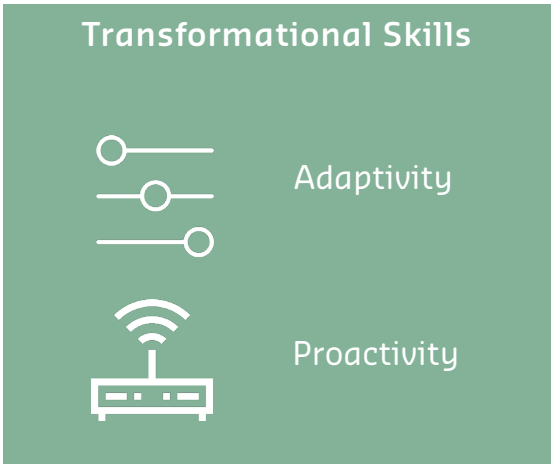
The MAPNet framework details key skills required for employees and organisations to be successful for the future of work.

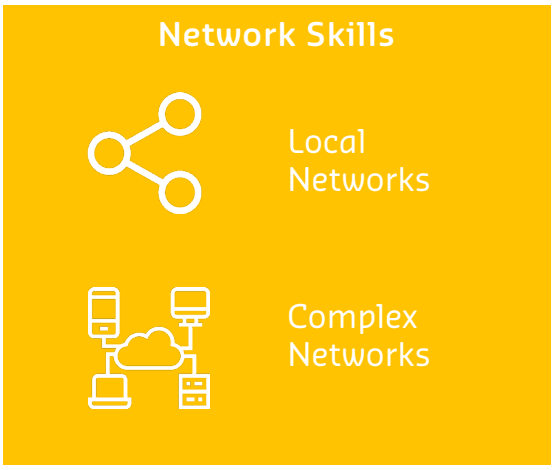
Mastery – doing core tasks to a high standard - is the foundation from which skills for uncertainty and adaptivity are developed.

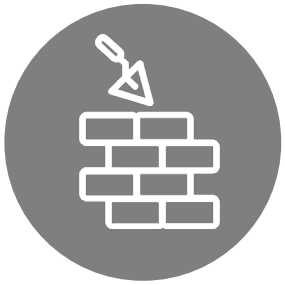
Uncertainty means complexity and unpredictability, so it is important that individuals are able to adapt to change and be agile (**adaptivity**). But adapting alone is insufficient – what is also needed is individuals who are able to be proactive and lead change (**proactivity**). Adaptivity and proactivity are key '**transformational skills**' needed for the future.

Interdependence means the need for more co-ordination and collaboration, which highlights the need for '**network skills**', both in terms of **local networks** (such as work teams) and **complex networks** (such as multi-team systems).

To effectively meet the challenges of future work and enable the workforce to be equipped with these future skills, both individual behaviours (individuals' changing their skills and orientation) and organisational behaviours (setting the right conditions for upskilling and orientation changes) are required.

# FOUNDATION SKILLS: MASTERY

The foundation of MAPNet is the concept of mastery; the ability to perform core tasks with a high level of proficiency [5,6,7]. Our focus on change and adaption does not mean that core skills are less important than other skills. On the contrary, it is more urgent than ever to identify the key knowledge and abilities that generate mastery at work.

Mastery of any skill, whether piano playing or computer programming, is typically achieved through dedicated practice and effort. Critically, we can achieve mastery of skills only when the requirements of an activity can be reasonably well specified. That is, when uncertainty and interdependence around the activity are relatively low. It is this condition that led earlier work models to focus almost entirely on mastery in terms of proficiency, and why there is such confusion now about the importance of core task skills.

MAPNet addresses the challenge of identifying predictable core skills in a rapidly changing world by clarifying the meaning of mastery for both core technical skills and core social skills. The knowledge and abilities required for mastery can usually be codified in documents or conveyed through repeatable practices and routines.

Of note is that the features that define mastery also coincide with features of work that can be automated. Tasks most easily automated are those with defined, predictable steps, meaning mechanical or computational alternatives can be designed more readily. This automation process is not new and industrialisation tells a constant story of extraordinary examples of mastery (e.g., furniture making) being lost to mechanical processes. The digital age is generating new ways of replacing mastery by replicating the knowledge and execution of tasks.

The progress of automation creates a dilemma for understanding mastery. On the one hand, it is important to understand core work skills that can be incorporated in education systems and other forms of codified knowledge for workers. At the same time, these are the very skills most likely to be replaced by automation through AI and robotics.

We address this dilemma in two ways. First, we encourage a better understanding of the core tasks that are important in organisations. Whether performed by people, automation, or a combination of both, it is important to articulate these activities in terms of uncertainty and interdependence. MAPNet provides a new way of articulating these activities in terms of:

**Mastery – technical skills:**

Core skills necessary for performing activities in science, technology, engineering, and mathematics (STEM) or procedural tasks.

**Mastery – social skills:**

Core skills for self-awareness and social skills such as cooperation and perspective taking.

Next, we describe how a solid mastery foundation can be built on and enable transformational skills such as adaptivity and proactivity.

# TRANSFORMATIONAL SKILLS: ADAPTIVITY

Adaptivity involves adjusting oneself and reconfiguring responses in a changing environment. Technological advances, organisational redesign, and volatile economic conditions can all make work uncertain. Adaptivity explains how people are able to adjust themselves to change and maintain both motivation and effectiveness in the face of uncertainty. Through adaptivity, people apply their current knowledge and skills to new situations that are more diverse and more complex than the ones they have previously encountered[8].

Adaptivity requires flexibility in thinking and acting to continually monitor the environment and adjust goals and strategies. We identify three critical steps in an ongoing process of adaptivity.

**Vigilance**

Maintaining awareness of the changing environment by scanning for important changes and monitoring one's own effectiveness in responding.

**Openness**

An ongoing learning orientation and readiness for change.

**Adjustment**

Continuously changing actions through both behavioural and cognitive flexibility.

The above three components unfold in an ongoing cycle of action and reflection that can only be developed through practical experience and learning opportunities.

# TRANSFORMATIONAL SKILLS: PROACTIVITY

Proactivity is a set of self-starting, action oriented behaviours that change the situation or oneself to improve personal or organisational effectiveness[9].

An example is using one's own initiative to investigate and adopt a piece of technology to improve work processes. Other examples of proactivity include: thinking for one's self, being self-starting, speaking out with ideas, identifying future skills that are needed, thinking ahead to anticipate problems, and being innovative.

Defining aspects of proactivity include:

- Being self-starting.
- Driving change.
- Being future focused.

Two types of knowledge, skills, and abilities (KSAs) have been proposed as key to proactivity: a solid understanding of one's work (i.e., mastery of job-related KSAs[10]) and context relevant knowledge. It has been proposed that both knowledge of the wider work system and the relationship between its components, as well as being able to adopt the viewpoint of others all positively impact on the likelihood of proactive behaviour[11].

But proactivity is also about motivation. Task and work design, as well as social and organisational factors, have also been shown to affect proactivity by fostering the motivation needed. For example, if people have more job autonomy, they are more likely to take ownership to drive change. And if people have empowering and supportive leaders, they are more likely to feel psychologically safe enough to take the risks involved in being proactive.

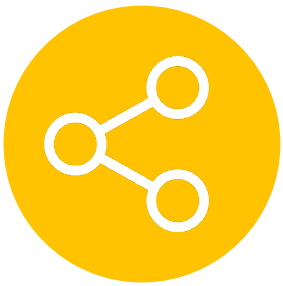
## Key KSA's for Proactivity

### Integrated Understanding

- Job-related knowledge, skills and abilities
- Understanding of the wider work system/relationship between its components

### Perspective Taking

- Being able to adopt the viewpoint of others



# NETWORKED SKILLS: LOCAL NETWORKS

A substantial amount of work in organisations is now completed by teams. Team work allows individuals to achieve something greater than their individual capabilities through utilising a network of skills and abilities[12]. However, team success is not only impacted by individual members' capabilities, but also the processes used by team members, and the resources available to the team.

Teams usually have multiple goals, requiring the completion of multiple processes at the same time and in an appropriate order to successfully achieve a goal[12]. Factors such as deadlines and individual schedules require adjustments to implemented strategies, pace, and individual roles in order to successfully achieve group goals.

With recent improvements in video-conferencing technology and global workplaces, geographically dispersed teams are now commonplace. Virtual teams can vary in a number of ways, such as; geographic dispersion, electronic dependence, dynamic structure, and national diversity[13].

Therefore, while a virtual team may exist similarly to physical teams, it is also possible for a virtual team to be dispersed across the world, rely exclusively on technology to communicate, be limited in lifespan with fluctuating membership and contain diverse nationalities and languages[14].

Work teams are also increasingly moving from purely human teams to human-technology teams. While completely autonomous, self-learning robots are not yet infiltrating work, a technological team member often includes a semi-autonomous independent team member controlled or supervised by human team members. Examples of semi-autonomous team members in local networks can be found across many industries such as industrial robots in manufacturing or bomb disposal robots, which fill an important role in bomb squad teams.

While the emergence of cooperative human-technology teams has allowed for the achievement of more complex or dangerous goals, it has also required humans to develop different skills to effectively collaborate within these new teams.

# NETWORKED SKILLS: COMPLEX NETWORKS

Modern work often requires a complex network of skills achieved through multiteam systems. Multiteam systems are defined two or more teams working interdependently towards shared goals[12]. Multiteam systems are able to complete tasks requiring the combination of a complex network of skills beyond the individual and team level of analysis[12] and are found across industries such as space, the military, and emergency response sectors (see page 33 for an example of a complex multiteam system).

Tasks performed by multiteam systems create unique and challenging situations as they often require coordination of efforts for multiple, previously unacquainted component teams. Furthermore, multiteam systems often demand skill sets and areas of expertise of individual teams to be combined and integrated in new ways to tackle challenges [15-17].

Due to the combination of component teams and varying situational demands, multiteam systems involve complex communication and goal structures[18]. For example, the degree to which there is functional diversity within a multiteam system may impact on communication networks.

Multiteam systems with high diversity may require 'boundary spanning' team members who bridge differences and relay information between diverse disciplines[19].

While local networks may involve a cooperative technological team member, complex networks in modern work may be comprised of multiple humans and machines across physical, virtual and remote teams simultaneously taking part in decision-making processes.

The rise in complex human-robot teams has led researchers to examine the concept of Cognitive Cyber Symbiosis (CoCyS)[20]. CoCyS describes a networked cloud-based team of humans and machines, where each individual or system represents a node in a network and are linked in a multitude of ways.

While engineers are still working on enabling AI to undertake self-learning and become fully interdependent and autonomous, it is likely that in the near future modern networked teams will involve fully independent AI members and new skills will be required by humans to work in such complex teams.

# INTEGRATION SKILLS: TRANSFORMATIONAL NETWORKS

The skills described in previous sections do not function in isolation. High performance is achieved when individuals integrate transformational and network skills.

The table below demonstrates what integrated skills might look like in an organisation.

For many strategic roles, there is a need to integrate all MAPNet skills to achieve success. For example, a logistics company with high automation and complex goals requires key people who have *mastery* skills in core disciplines, and an ability to *adapt* to market changes and consumer needs while being highly *proactive* in pursuing performance and growth via the development and exploitation of *local and complex networks*[21-23].

## WHAT DO INTEGRATED SKILLS LOOK LIKE?

| | Network Skills: Local and Complex Networks |
|---|---|
| Foundational Skills | • Being aware of where one's own tasks sit within wider networks and organisational goals<br>• Completing one's own task to an appropriate timeframe and standard to enable the success of others |
| Transformational Skills | • Maintaining awareness of the functioning of networks and identifying opportunities for improvement<br>• Being responsive and adapting to dynamic goal changes of the network, work processes, schedules etc.<br>• Being open to upskilling to maintain currency with the introduction of more advanced technologies |
| | • Identifying opportunities to improve the functioning and efficiency of networks through rolling out technologies/innovations to improve work processes<br>• Expanding existing networks to meet the wider needs of an expanded client base |

# SKILLS TRANSITIONS: EDUCATION AND TRAINING

MAPNet provides a framework for designing education and training programs. The framework can be used to evaluate the coverage of current programs and identify areas of focus and development.

More importantly, MAPNet identifies transitions between skills to explain and support development over time. We identify two pathways for skills development:

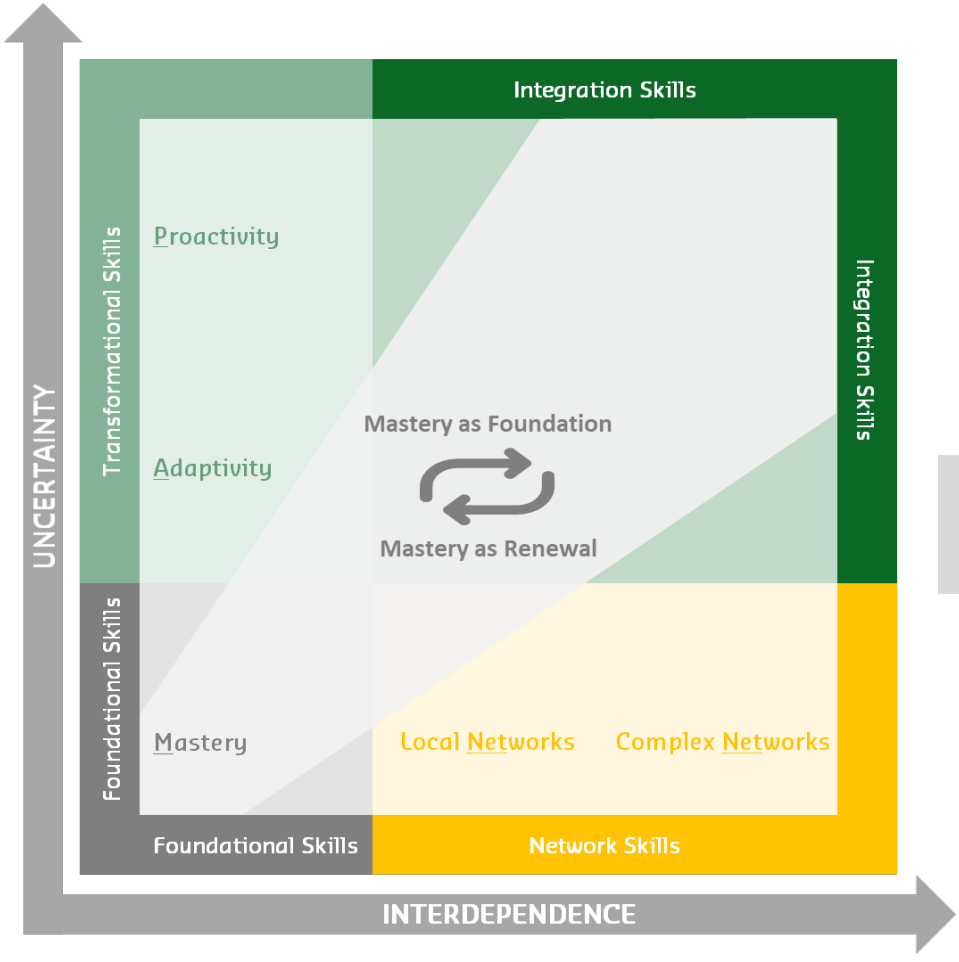
**Mastery as foundation**

Mastery is the foundation on which transformational and network skills are developed

**Mastery as renewal**

Transformational and network skills create new forms of mastery

We will now explain these two pathways in more detail.




Skills development pathways

# MASTERY AS FOUNDATION

Mastery as the basis for more complex skills is an intuitive way of thinking about skill development. Generally, skill development follows a path from thinking about a skill and how to execute it, to purposeful practice to reduce errors and then on to an autonomous ability to complete a task. Complex skills may be viewed as the amalgamation of mastery over a number of more basic skills. For example, mastering the ability to interpret, analyse, and describe data trends for a lay audience allows for high performance in a data analyst role.

Establishing mastery of some key skills or pieces of knowledge allows workers to apply those skills or knowledge in a number of ways. That is, by setting the foundation of mastery of key KSAs, workers will be able to: use those skills in uncertain settings adaptively as needed; proactively sense when those skills require change; and use those skills to help achieve collaborative goals when working in local and complex networks.

# MASTERY AS RENEWAL

As technology has changed the way we interact and communicate between ourselves and technology, new types of organisations (e.g. online based), work roles (e.g. Chief Analytics Officer) and in-demand skills (e.g. app developer) are continually changing. These changes have led to some traditional skill sets becoming obsolete or automated (e.g. mining dump truck driver) and numerous new roles created in response to changes in market demands (e.g. big data analyst).

Over time, previously new skill sets increasingly become expected as being core skills (e.g. basic IT proficiency) and previously emergent jobs become more common and accessible to re-skill into (e.g. social media manager). In other words, what was once considered new ways of work become part of organisational routines and new skills are developed; mastery is renewed.

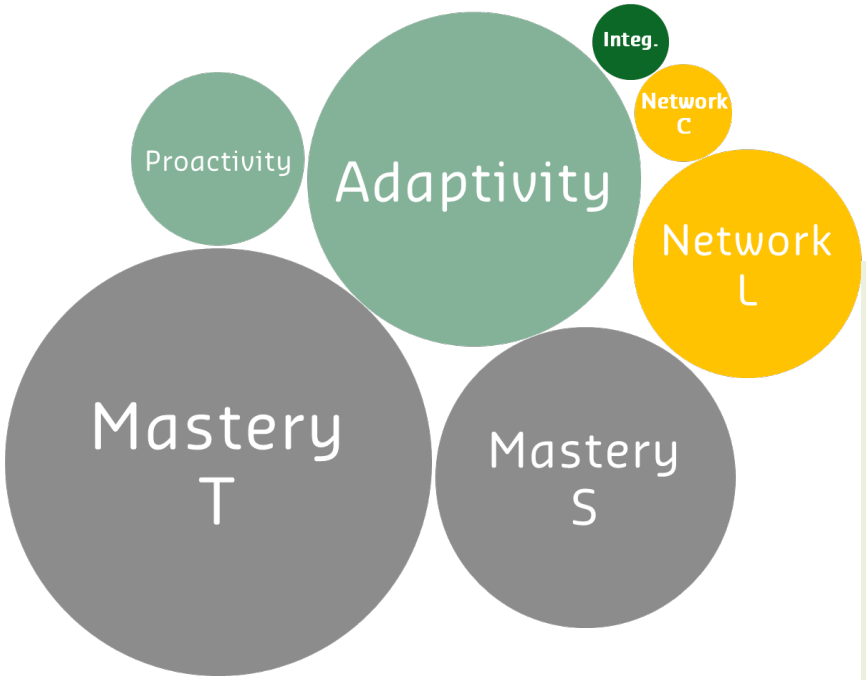
# PART THREE

# FRAMEWORK COMPARISONS

We conducted a desktop analysis of multiple publicly available skills information frameworks in order to analyse the alignment between existing frameworks and MAPNet. Nineteen cases were analysed and covered a broad range of geographical areas, including: Europe, the United States of America, Australia, New Zealand, Canada and Singapore. Core skills from the frameworks were categorised into the seven MAPNet skills categories.

Results showed that the majority of frameworks focused on both foundational mastery skills and lower level transformational skill of adaptivity. Proactivity and local network skills were mentioned in a moderate number of frameworks, with complex network skills and integration skills being discussed in only a handful of frameworks.

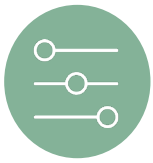
This finding highlights the conventionality of frameworks to focus more on static and foundational skills whilst omitting the transformational and networking abilities that allow for work in an unpredictable and interconnected world.




Packed bubble chart demonstrates relative number of mentions of skills in scanned frameworks, as categorised into the seven MAPNet categories.

*Notes: Master T = Mastery, technical; Mastery S = Mastery, social; Network L = Local Networks; Network C = Complex Networks; Integ. = Integrated Skills*

| | TECHNICAL MASTERY | SOCIAL MASTERY |
|---|---|---|
| **Phoenix University**[24] | New media & computational literacy | Social intelligence |
| **Data61**[25] | STEM & technical skills | Communication skills |
| **McKinsey O*net**[26] | Physical skills<br>Cognitive skills | Social skills |
| **World Economic Forum**[27] | Technology design & programming<br>Reasoning problem solving & ideation<br>Systems analysis & evaluation | Emotional intelligence |
| **PWC**[28] | | Emotional intelligence<br>Service orientation |
| **Pearson**[29] | Instructing<br>Sociology & anthropology<br>Education & training<br>Fluency of ideas | Psychology<br>Social perceptiveness |
| **EmployABILITY**[30] | Basic literacy<br>Personal & critical literacy<br>Rhetorical literacy<br>Occupational literacy | Emotional literacy<br>Ethical cultural & social literacy |
| **Accenture**[31] | Specialize for work | |
| **McKinsey Skill Shift Report**[32] | Basic cognitive skills<br>Physical & manual skills<br>Technological skills | Social & emotional skills |
| **NCVER**[33] | Technical<br>Lower order cognitive | Socio-emotional |
| **ESCO**[34] | Application of knowledge<br>Health & safety<br>Digital competencies<br>STEM<br>Working environment skills | Attitudes & values<br>Social interaction |
| **European Commission Skills \Panorama 2017**[35] | Computer & electronic skills<br>ICT literacy<br>Job specific /technical skills<br>STEM<br>Foreign languages | Communication & verbal skills<br>Foreign language<br>Customer handling skills |
| **Future Skills Lab**[36] | STEM<br>Document use<br>Digital Skills | Oral communication<br>Attitude<br>Presentation |
| **NZME**[37] | Using language, symbols & texts | Managing self<br>Relating to others |
| **The Future of Education & Skills**[2] | Disciplinary knowledge<br>Practical knowledge<br>Physical & practical skills | Social & emotional skills<br>Attitudes & values |
| **SFIA**[38] | Development & implementation<br>Delivery & operation skills | |
| **Singapore Skills Frameworks**[39] | ICT skills<br>STEM skills<br>WHS | Interpersonal skills |

| |  ADAPTIVITY |  PROACTIVITY |
|---|---|---|
| **Phoenix University**[24] | Sensemaking<br>Cognitive load management<br>Design mindset | Novel & adaptive thinking |
| **Data61**[25] | | |
| **McKinsey O*net**[26] | | Generating novel pattern & categories<br>Creativity |
| **World Economic Forum**[27] | Active learning & learning strategies<br>Critical thinking & analysis<br>Complex problem solving | Analytic thinking & innovation<br>Creativity, originality & initiative |
| **PWC**[28] | Complex problem solving<br>Judgement & decision making<br>Cognitive flexibility<br>Critical thinking | Creativity |
| **Pearson**[29] | Learning strategies<br>Active learning | Originality |
| **EmployABILITY**[30] | Rhetorical literacy | |
| **Accenture**[31] | Cultivate a growth mindset<br>Learn to learn | Create & solve<br>Build tech know how |
| **McKinsey Skill Shift Report**[32] | Higher cognitive skill | |
| **NCVER**[33] | Higher order cognitive | |
| **ESCO**[34] | Thinking skills | Problem-solving with digital tools<br>digital content creation |
| **European Commission Skills \Panorama 2017**[35] | Judgement & decision making<br>Learning skills<br>Planning & organisation skills | Problem solving |
| **Future Skills Lab**[36] | Thinking & learning<br>Adaptability & resilience<br>Planning & accountability | Motivation |
| **NZME**[37] | Thinking | |
| **The Future of Education & Skills**[2] | Cognitive & meta-cognitive skills<br>Reconciling tensions & dilemmas<br>Taking responsibility | Creating new value |
| **SFIA**[38] | Strategy & architecture<br>Skill and quality management | Change & transformation |
| **Singapore Skills Frameworks**[39] | Personal Management & development skills<br>Analytical, conceptual & evaluative skills | |

| |  NETWORK LOCAL |  NETWORK COMPLEX |  INTEGRATION |
|---|---|---|---|
| **Phoenix University**[24] | Virtual collaboration | Cross-cultural competency | Transdisciplinary |
| **Data61**[25] | | | |
| **McKinsey O*net**[26] | Coordinating with multiple agents | | |
| **World Economic Forum**[27] | Leadership & social influence | | |
| **PWC**[28] | People management<br>Coordinating with others<br>Negotiation | | |
| **Pearson**[29] | Coordination | | |
| **EmployABILITY**[30] | | | |
| **Accenture**[31] | Applying collaborative intelligence | | |
| **McKinsey Skill Shift Report**[32] | | | |
| **NCVER**[33] | | | |
| **ESCO**[34] | Digital communication & collaboration<br>Digital data processing | | |
| **European Commission Skills \Panorama 2017**[35] | Teamwork | | |
| **Future Skills Lab**[36] | Working with others | | |
| **NZME**[37] | Participating & contributing | | |
| **The Future of Education & Skills**[2] | | | |
| **SFIA**[38] | Relationships & engagement | | Interdisciplinary knowledge |
| **Singapore Skills Frameworks**[39] | Leadership & people management | Business management | Service Excellence |

# PART FOUR

# DEVELOPING AND SUPPORTING THE MAPNet SKILLS

Below we give an overview of some of the key conditions and systems that are needed to develop and support the MAPNet skills, namely: work design, motivation, teams, selection and training, and leadership.

To support and develop the MAPNet skills, adaption in these areas are usually required at the organisation level.

However, there are also a number of opportunities for individuals to engage their own sense of agency in preparing for the future of work and both are discussed below.


FRENCH

# WORK DESIGN

The impact of increasing uncertainty and interconnectedness continues to change the very nature of work in multiple ways. Flexible forms of independent work are on the rise and many people are now choosing to work outside of traditional roles. Digital platforms such as Uber, Airbnb, and Etsy offer pathways into flexible work roles and their ongoing success highlights changing work design preferences for employees. In addition, changes in technology within organisations also alter work tasks and flow; the economy is no longer restricted by time or product/service location.

These changes bring both opportunities and associated challenges for designing good work. For example, the opportunity for 24/7 trading brings challenges for preventing employee burnout. The opportunity to embrace technology and enter new markets brings challenges associated with the unpredictability of work systems from evolving technology[40, 41] and changes in consumer demands[42].

The MAPNet framework demonstrates that when uncertainty is low, employees operate in the mastery zone, completing core tasks with high levels of proficiency and drawing motivation from achievement of KSAs. Therefore, at a mastery level, work design should allow for a level of predictability and independence, clearly outlining the proficiencies (social and technical) that are important to perform that role.

However, as uncertainty increases employees need to take on new and more transformational roles, including reacting to change (adaptivity) and initiating change (proactivity). At low levels of predictability and independence roles must be adjusted to be more dynamic, enabling the workforce to flourish in the face of uncertainty and to harness broad networks with ease. Therefore, work design for roles in uncertain environments requires increased employee autonomy[43] in an environment that generates motivation by encouraging and responding to innovation, even when uncertainty is at its highest.

Changes in work design which attempt to optimise unpredictability via encouraging proactivity, integration and creation, can already be seen. Such initiatives include work design changes such as hybrid or collaborative workspaces, flexible work options, peer-to-peer sharing capabilities and even the release of organisational analytics to roles other than traditional analysts. From an individual perspective, as technology changes the way we work, it also presents an opportunity for self-initiated role changes to be made via engaging in job crafting or taking on new responsibilities to further career development.

Fluidity in work design will be key to address rapid technological gains and corresponding changes in key human skills. In order for this to occur, work design will need to consider both the way technology is utilised and the impact on the user prior to implementation.

For example, in safety critical industries, reducing routine tasks through automation, such as paperwork, may result in the need for complex social skills and workload management skills, and may increase the risk of burnout in a workforce overwhelmed with complex work.

To provide another example, call centre employees have already moved from working primarily on basic resolutions to working only on complex issues as automation has taken over basic tasks (e.g. call re-direction, answering FAQ). While call resolution times may decrease, employees working all day on complex issues may suffer burnout and user experience may decline due to rigid and impassive automated call takers.

## GOOGLE: FLUID WORK DESIGN

Collaborative integration of research and development teams is common within Google, as many products require both algorithmic solutions but also high performance and marketability.

Within the Computer Science arm of Google, employees use what they call a "Hybrid Research Model" which encourages research and engineering to work together and pursue an optimised balance of skills. The balance of skills is completely fluid, with employees moving between projects as the need for certain skills arise. This fluidity gives employees a level of autonomy and enables them to use their skills proactively to help others [44].

# JOB ENRICHMENT

While addressing the skills and behaviours needed to thrive in future work is important, success cannot be achieved unless employees are motivated to develop and work in uncertain and interconnected environments. Financial gain and promotion have long been seen as the most important motivators in the workplace. However, motivating employees to develop skills to work under challenging conditions requires more than extrinsic reward[45]. Thus, in a world where work is completed across vast networks and unpredictability is the norm, creating a sense of meaning and feeling of competence for employees will be key in nurturing intrinsic motivation - a feeling that their work matters.

One way of creating a greater sense of meaning for employees is through job enrichment. Job enrichment requires organisations to increase employee autonomy over the planning and execution of their work[46]. Successful job enrichment enables employees to work dynamically, taking advantage of networks as required and facilitates effective decision making[47].

Given that job enrichment has been found to enhance performance when operational uncertainty is high rather than low, the optimal level of autonomy for a work role will need to be carefully considered. For example, roles that are required to be highly proactive within complex networks will require higher levels of autonomy than roles which require independent mastery of tasks. If a role is operating in an environment with low interconnectedness and low uncertainty, a focus on prescribed roles should be encouraged and employee motivation should be derived from the mastery of KSAs.

More broadly, any changes that occur to organisational processes, job design and work processes can have a detrimental impact on motivation by increasing uncertainty beyond optimal levels. As uncertainty increases, organisations can guard against apathy by transparent communication, providing learning support or encouraging opportunities to work in new ways. Encouraging employees to think critically about their passions, interests and skills and cultivating a growth mindset will lead to new and interesting opportunities which fuel motivation.

## NETFLIX: MEANING, INNOVATION AND AUTONOMY

With an annual revenue growth of 35% in 2018, Netflix is proving successful in its field. Behind this success are a set of policies outlining employee autonomy and responsibility that is worlds apart from most organisations.

Freedom and responsibility are a key part of the Netflix culture with their culture guide stating that they aim to "increase employee freedom as we grow, rather than limit it..." and to rely on talent diversity rather than rules to deal with growth and complexity.

In line with these values, employees and managers have autonomy over regulating the balance between work-life and personal-life. There is no vacation policy and time-off is not tracked.

The policy for company expenses details an expectation of adult like behaviour of "Act[ing] in Netflix's best interests". Employees are expected to travel as if it were their own money and take from Netflix only when it is "inefficient to not take and inconsequential".

Performance reviews consist of informal 360 degree reviews and managers are expected to have ongoing honest, adult conversations with employees as an organic part of work.

Employees choose their equity compensation and have no vesting period, meaning they can leave the company at any time without any detriment to themselves. This policy assumes that those who are motivated to stay, will and those who are not are best working elsewhere.

Importantly, many of these increases in autonomy and freedom are for salaried employees only. Employees paid by the hour under more structured roles are given less autonomy to complete their tasks[48]

# TEAMS

While teams have always been a consistent feature of work, the way teams are comprised, and function will change. Individuals will increasingly work across a range of industries, organisations and cross-functional teams. In order for this cross-functionality to be successful organisations need to enable the development of related skills but also develop a team structure that supports required skills and behaviours.

For example, it has been shown that when team autonomy is high, there is a positive relationship between task uncertainty and team performance[49]. Teams working in uncertain environments will perform better with high team autonomy, allowing them to integrate information, make use of networks and be proactive on-the-fly. In contrast, low interdependence teams have improved performance when there are high levels of individual autonomy to employ mastery[50].

As automation, virtual teams, and global markets become increasingly common, new technological infrastructure will be needed to support effective collaboration for both human-human and human-automation team dynamics. Recently, there has been a notable increase of collaboration tools but allowing teams to use their skills most effectively will be contingent on implementing the right tools and enabling teams to maximise their useability.

## THE INTERNATIONAL SPACE STATION: COMPLEX NETWORKS ACROSS TIME AND SPACE

The International Space Station (ISS) was a collaborative endeavour between 5 countries to build a habitable artificial satellite. Building began in 1998, inhabited in 2000 and additional add-ons have continued as recently as 2016.

As would be expected functional diversity within the program was significant, bringing together: flight crew, researchers, operations professionals, training and engineering specialists as well a multitude of technology and communications networks.

The complexity of teams was high, both within each country, and between countries with multi-national goals (e.g. the construction of the space station), national goals (management of own hardware) and sub goals (e.g. research goals, launch support etc.).

The ISS is an example of a particularly complex and diverse network operating within an environment of extreme varying situational demands and complex communication and goal structures. The ability for such a diverse range of professions, countries and teams to work together across vast distances and achieve overarching goals highlights the almost limitless possibilities of team structures in modern society.

# SELECTION AND TRAINING

Traditionally, organisations have identified changes in skill requirements and adjusted position descriptions and talent acquisition approaches accordingly. However, with improvements in technical capability, the process of identifying key skills and implementing selection and training changes is cumbersome and lags behind real-time requirements. This results in skill shortages, employability issues.

A more efficient approach to addressing changing skill requirements is by using the MAPNet framework to design training and selection processes to target overarching skills needed to deal with key organisational challenges that span across jobs, problems and domains, namely; uncertainty and connectedness. Of course, the level of ability required across these two domains will vary depending on a role's optimal level of uncertainty and interconnectedness.

For employees working in roles with low uncertainty and low interconnectedness, selection and training should concentrate on the mastery of relevant core skills. For those whose work is changing from independent and predictable to unpredictable and interconnected, re-skilling or upskilling will be required as adaptive and proactive behaviours become increasingly important.

All individuals possess some level of mastery and using this as a foundation to build new skills is motivationally beneficial to the individual and financially beneficial to the organisation. However, given the rapid rate of change and level of uncertainty about the growth and decline of industries and work roles, a lifelong learning orientation will be key as mastery is renewed. Enabling relevant parts of the workforce to be supported to up-skill and develop a lifelong learning orientation, will help ensure the ongoing efficiency and adaptivity of a technological workforce[51].

Pre-emptive partnerships for talent development may aid in 'staying ahead' of changes, addressing skill shortages and preparing for the introduction of new technology. Partnerships with educational institutions can help with targeted recruitment[e.g. 52], training or reskilling programs and allow for large-scale skill development, talent pipelines and at-scale adoption of automation.

## AT & T LARGE SCALE RESKILLING

AT&T is an American multinational organisation and one of the world leaders in communications, media and technology. The company was founded in 1983, and it has successfully operated through a number of technological changes. However, a 2008 gap analysis revealed that approximately only 50% of AT&T's quarter of a million employees possessed relevant skills for the future.

Given the choice between rehiring a vast number of software and engineering professionals or reskilling almost half their workforce, AT&T decided to undertake a complete workforce reskilling program.

Since 2013 AT&T has spent over $250 million on employee education and PD programs, but has also reported filling half of all new technology management jobs with their own retrained employees. Additionally, almost half of all promotions were given to retrained employees and AT&T reports having reduced its product development life-cycle by 40% [53]

A similar program has also been initiated by JPMorgan Chase, who was recently reported as investing $350 million over 5 years into a Future of Work Initiative. The initiative is aimed at creating economic mobility and career pathways for underserved populations, but also aiding the forecast of emerging skillsets for JPMorgan Chase employees. The initiative will also involve the development of new training programs to prepare JPMorgan Chase for ongoing changes in the work environment[54].

# LEADERSHIP

For leaders to be successful in taking their organisations forward, talent development and a well-designed workforce strategy will be key. Rapid changes in market demands and ways of working will mean that organisations will no longer be able to rely on ready-made human capital. Instead organisations will need to rely more on proactive and innovative skill-building.

In order to plan for and support the development of skills, leaders will first need to have sufficient knowledge to understand which technology the best is to adopt and how to implement it. Appropriate planning and communication of expected future changes will be important in allowing employees to engage in career planning and have a sense of agency and motivation to use new technology.

Constructing and communicating skill requirements and up-skilling opportunities allows employees to evaluate whether they will: stay, upskill, re-train or move organisations. Implementing initiatives such as role-rotation and cross-role collaboration will also aid in supporting employee mobility and reducing skills gaps.

As roles and skill requirements change, human resource leaders will also need to adapt the way they work. Careful workforce planning and structuring of the organisation will improve the ability to be agile and respond to change. For example, building an inclusive C-suite by including finance, human resources, and technology experts would aid in aligning talent, finance, and automation decisions.

Building organisational agility also extends to a re-examination of the way people work. Allowing flexible work will help accommodate rises in virtual, freelance and global collaboration. Successfully implementing flexible work practices will also attract diverse talent across age, gender and ethnicity.

More broadly, leaders will need to engage with external stakeholders, creating multi-sector partnerships and collaborating with industry partners. Expanding the organisation's network will result in a pool of resources, talent and opportunities, supporting employees' skill development and mobility, as well as reducing associated costs to individual organisations.

## BLACKROCK: EMBRACING THE FUTURE OF WORK

BlackRock is an American investment management company, which is the world's largest asset manager. The company is heavily reliant on technology. In order to continue to flourish in the changing work landscape, BlackRock's leadership team has implemented a number of innovative programs.

Internally, BlackRock has implemented a reverse mentoring program which pairs senior leaders with junior technical mentors, allowing leaders to gain a greater understanding of new technology. To facilitate and support lifelong learning the company has a portal detailing training, trends and information about new technology being used or introduced. If a particular type of expertise is required by an employee, the internal application 'OneBlackRock' simplifies the identification of expertise and experience across all members of the organisation.

Techfests and Hackathons are run to increase cross-role engagement and allow employees to come together physically or virtually to discuss new ideas and design solutions.

To encourage a long-term pipeline and engage a diverse workforce, BlackRock donates to Code.org which supports free online technical curriculum development. BlackRock also runs summer immersion programs to encourage more females to code, and provides scholarships to students from low socioeconomic backgrounds [52].

# PART FIVE

# WHAT IS DRIVING THE CHANGE IN WORK?

Governments, organisations, and communities are grappling with the demands of future work. Below we review the key trends that demand new ways of thinking about skills and work requirements.

TECHNOLOGY AND AUOTMATION

DEMOGRAPHIC CHANGES

COLLABORATION

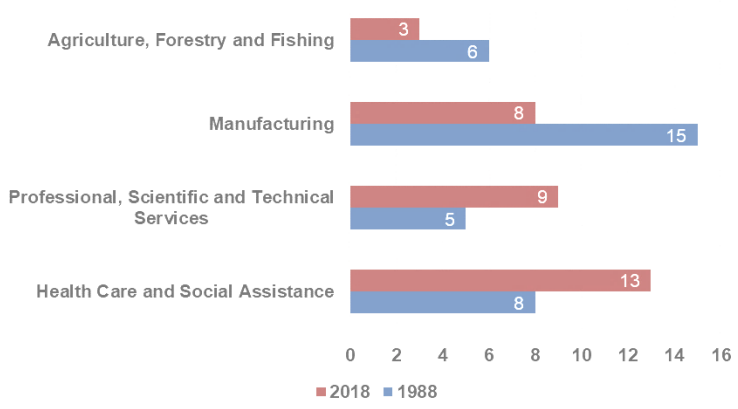
BIG DATA

## TECHNOLOGY AND AUTOMATION

Technology is rapidly changing work across many industries, through automating tasks, opening new modes of communication, and creating new sources of information. A key feature separating current technological advances from those of previous industrial revolution is the rapid development of networks among people and products mediated by ever more advanced algorithms that automate analysis and decision making. This potential for large-scale hyper-connection is typically termed the 'internet of things'[3].

Researchers have noted that automation does not just do tasks for humans, it actually changes the nature of humans' tasks[56]. Therefore, with the advance of technology and automation, the types of jobs are changing and also the skill requirements within jobs [57, 58]. These changes have resulted in market unpredictability, associated skill mismatches [59,3], and post-education employability failures[30]. Such challenges call for a re-conceptualisation of skills for the digital age[60].

Rapid growth in the accessibility of information and computer processing power is driving new technological capabilities[2]. Automated controls and data analyses are reducing the requirement for human input in routine decision-making and physical tasks [61,62,63]. Thus, technology growth is accompanied by a decline in routine roles (e.g., sales assistants) and an increase in employment in non-routine roles (e.g., aged care). These findings are synonymous with data from the Australian Government showing decreases in employment within traditionally routine manual and routine cognitive roles (e.g. manufacturing). Data from the Department of Innovation, Industry, and Science also show a negative relationship between a job's automation potential and the average annual growth[51]. The rate of technological capacity and accessibility are predicted to increase exponentially into the foreseeable future[63].




The % share of total employment for selected industries in 1988 and 2018. The figure demonstrates the move away from traditional routine industries with a growth in non-routine service industries[64].

# TECHNOLOGICAL DESIGN

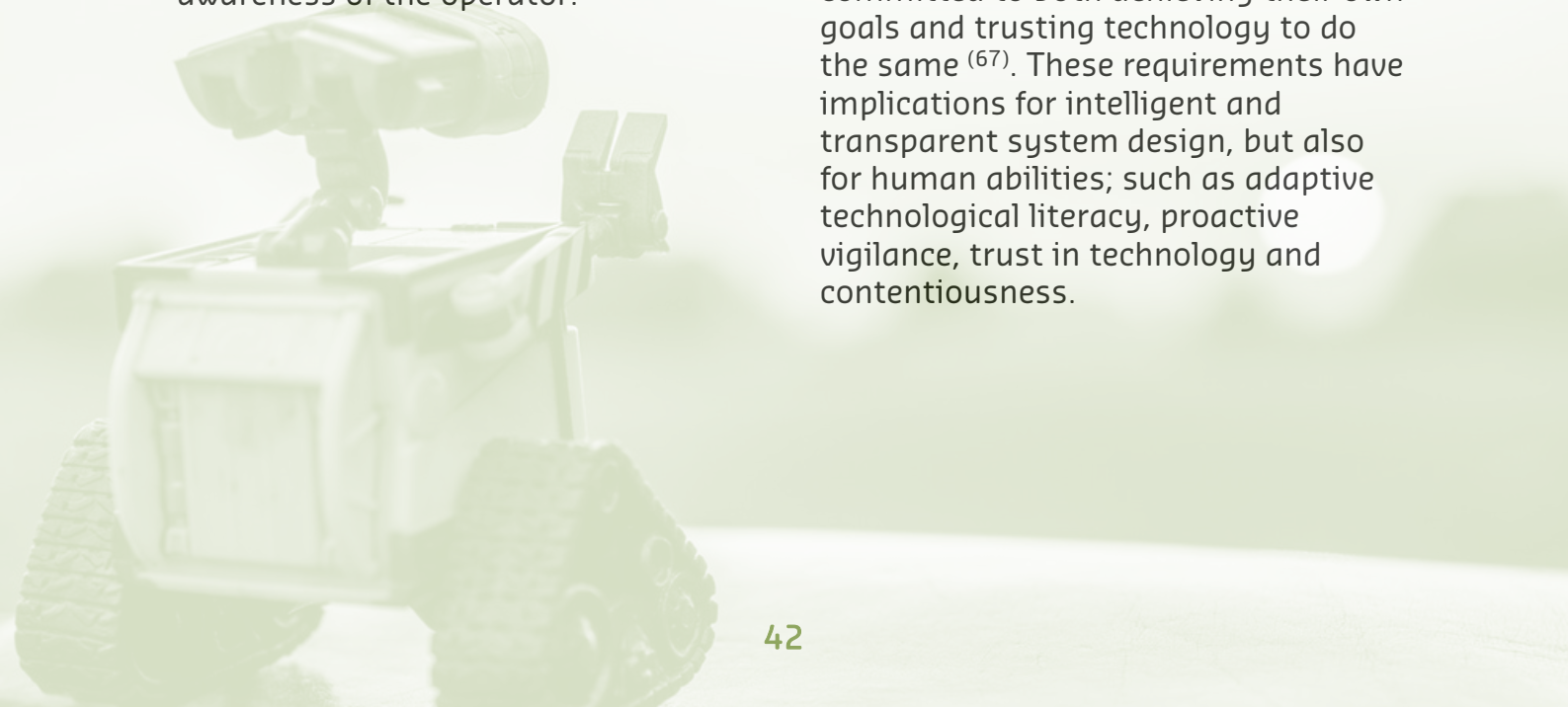
While technology is designed to allow us to transcend our human capabilities, it is only effective if employees have appropriate trust in the technology, and when human and technological agents identify common goals and work efficiently, effectively and safely together.

Although technological design is improving rapidly, the creation and use of technology that fails to identify user needs and usability requirements continues to present ongoing challenges to human work design, motivation, team efficiency and training needs assessments. In other words, technology meeting functional requirements may still not be effective, efficient or satisfying to use and can cause detriments to user performance and/or wellbeing and unforeseen training needs [65].

For example, a common reason for errors in complex and automated environments is a loss of situational awareness of the operator.

Working with complex technology that completes tasks autonomously prevents the operator or team member to follow what the technology is doing. If the technology fails, the operators do not know which functions to perform or how to perform the functions required to complete the usually automated tasks[66]. The more autonomous technology is, the less information human operators or team members will be able to process about its behaviour. Given that automated systems sometimes fail, the ability for humans to intervene and regain control in the context of a failure is key to safety and task performance.

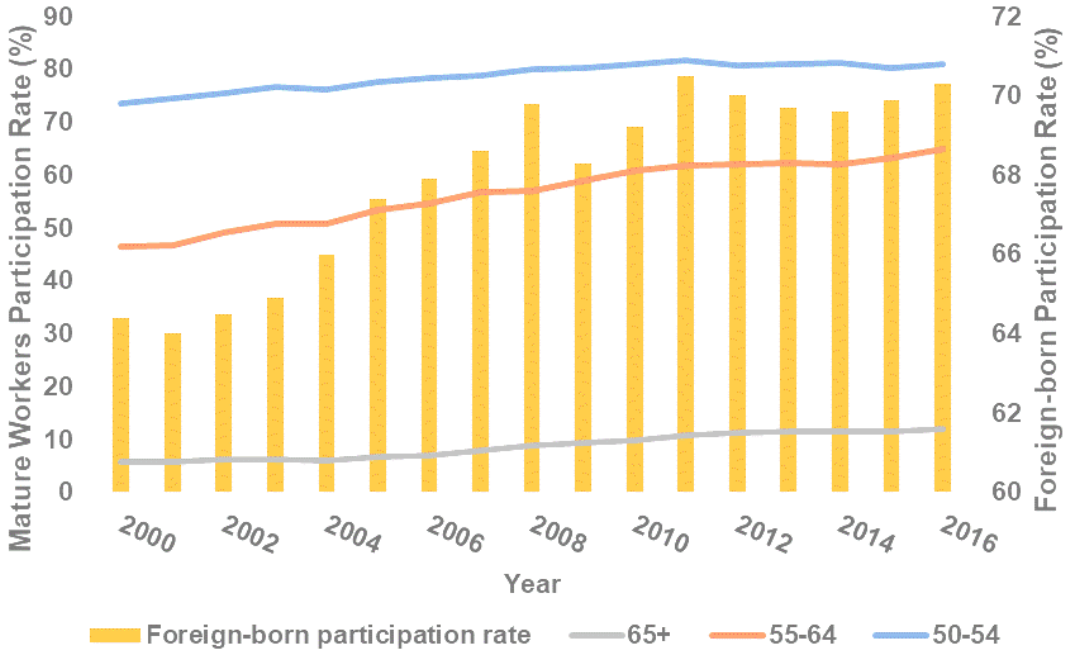
For semi-autonomous technology and humans to successfully partner, there is a requirement for systems to be designed to be socially adept at interpreting human intentions, beliefs, desires and goals, as well as being able to communicate its own intents and goals. Human team members must be competent in task completion and committed to both achieving their own goals and trusting technology to do the same [67]. These requirements have implications for intelligent and transparent system design, but also for human abilities; such as adaptive technological literacy, proactive vigilance, trust in technology and contentiousness.



## DEMOGRAPHIC CHANGES

Globalisation, migration, and integration across national boundaries has been increasing with improvements in transportation, communication, and online networks[2]. Organisations previously constrained by infrastructure or resources are now innovating at rates faster than some developed nations (e.g., India in the telecoms space). Research, design, and innovation are no longer only competencies for developed nations and global recruitment strategies are now commonplace.

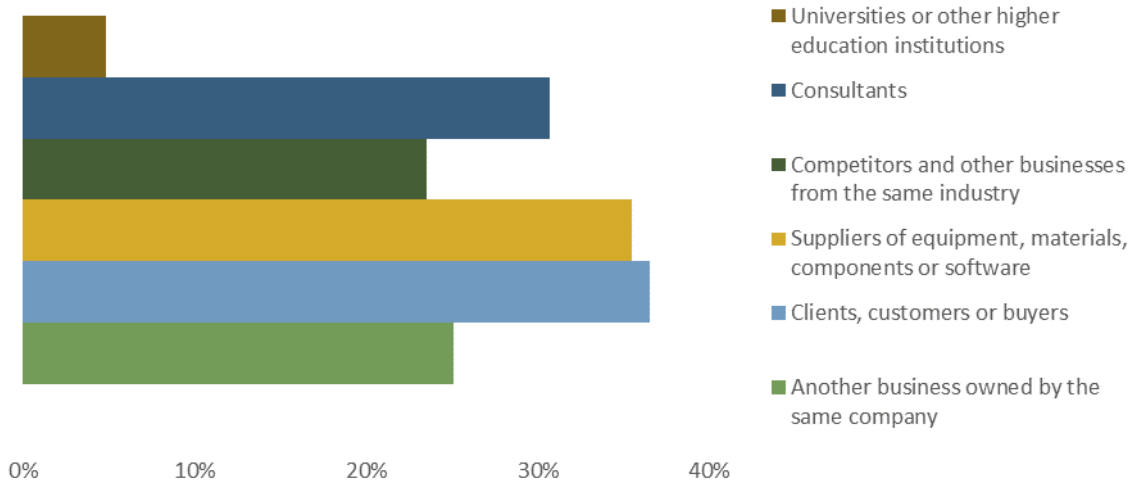
This globalisation of the workplace brings requirements for cross-collaboration between sectors, cultures, and languages[3].
In addition to migration and integration, longevity is improving. Increased longevity boosts the available workforce. However, this is a challenge for reskilling and upskilling as the rate of technological advancement is outpacing required changes in the educational system and organisational training programs[2, 68].




Participation rates of mature and foreign-born residents of Australia, 2000-2016. Figure shows an increase in both mature and foreign-born individuals and therefore increasing diversity in the workplace. Data retrieved from the Australian Bureau of Statistics [69, 70].

## COLLABORATION

Improvement in access to, and the maturity of social technology has allowed for collaboration on a scale previously confined to large organisations[7]. The ability to engage across micro and macro structures is delivering non-routine solutions to problems via collaborative innovation both within and across sectors[3]. For example, using gaming platforms (e.g. Foldit[71]), scientists have been able to engage lay individuals to solve complex algorithms in a way that single organisations could not. Thus, work skills are no longer coming from traditional management and organisational sources but from diverse fields across previously disparate areas of work[72]. In other words, organisations are shifting from vertically integrated to more horizontally integrated networks[59]. Additionally, the rise in automation has increased the need for a relatively new set of collaborative skills; human and technology collaboration. The sheer number of increased robotics in the workplace requires new abilities to communicate with the technology, both in terms of troubleshooting and analysis of data[72].

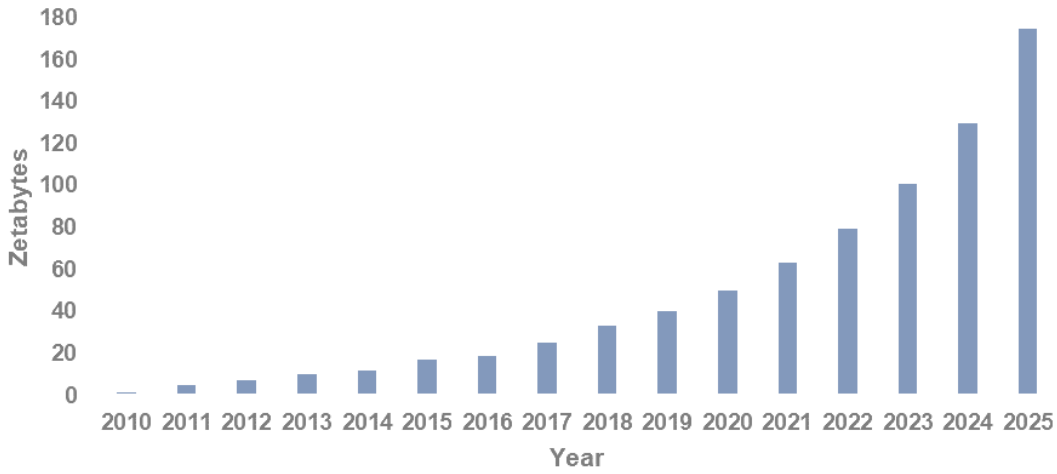



Collaboration within Australia by type of organisation collaborated with, 2016-2017. Business could select more than one option. Figure based on data from Australian Bureau of Statistics[73].

## BIG DATA

The global deployment of wearable, sensory, communicative, social, and medical technology is generating massive data streams creating new possibilities for data analysis, and interpretation on vast scales[3]. New work roles are emerging to encompass the requirement for analysing and using diverse data streams.

Database roles are being integrated into strategic plans and contributing across all aspects of an organisation such as maintenance, customer service, product innovation.




Estimated exponential growth in data. One zetabyte is approximately equal to a billion terabytes[74].

# PART SIX

## THE BUILDING BLOCKS FOR THE FUTURE

We have described the two key challenges of organisations and the skills of the future that are required to meet those challenges. Both the challenges and skills outlined are transversal and universal across time and industry. Other researchers and practitioners have noted key skills for the future and categorised them into various competency frameworks. We define the skills in the various competency frameworks as the building blocks for MAPNet skills. For example, critical thinking and problem solving are required for adaptive and proactive behaviours.

Across emerging frameworks there are several common themes for noted skills. These include: transferability of skills across fields, competencies that are multidimensional in nature (i.e., including knowledge, skills, and attitudes), higher-order abilities to cope with complex problems and unpredictable situations [75-77] and an emphasis on lifelong learning competencies rather than just knowledge acquisition [78-79].

Below we describe and define some of the most commonly noted key abilities, which we suggest as the building blocks of future skills, as outlined by the MAPNet framework.

## Critical thinking

Critical thinking has been defined as instances of analysing and assessing the strengths and weaknesses of your own thinking and being able to find ways to improve it[80]. Alternatively, the Partnership for 21st Century Skills[68] defined critical thinking in the context of 21st Century skills as effective reasoning, using systems thinking, making judgements and decisions and solving problems. While slightly different, these two definitions and others in the literature [81, 82] all share aspects of analysis, judgement, and the ability to make sound inferences. We define critical thinking as a transformational skill in which a level of adaptivity is required to think beyond previous experience and mastered skills.

## Problem Solving

The Partnership for 21st Century Skills [68] define problem solving as discovering and analysing a problem in order to find the best possible solution to overcome it by implementing a number of steps: 1) Identifying the problem, 2) defining the problem, 3) forming a strategy, 4) organising information, 5) allocating resources, 6) monitoring progress and 7) evaluating the result. Employees may develop mastery over problem solving in their role, but more complex problem solving will require a level of adaptivity to new solve new types of problems.

## Collaboration and Communication

Often mentioned together in frameworks, collaboration and communication are traditionally viewed as social skills and interpersonal competencies[83]. However, in the context of future work the rise in automation and globalisation will result in collaboration and communication being broad skills used to interact with local and complex networks.

## Creativity and Innovation

The definition of creativity or innovation does not seem to have a consensus in the literature or even across educational institutions, with theories on creativity spanning a wide range of areas (e.g. cognitive, psychometrics, evolutionary). However, it has been noted that most definitions include the production of something recognised as novel or useful in a certain context [84]. Some researchers argue that social and cultural contexts of creativity are important[85], and others argue that creativity is both a general and domain-specific ability[86]. Creativity and innovation occur when working in interconnected situations with high levels of uncertainty and requires a level of proactivity. Furthermore, creativity and the ability to think outside the box are particularly helpful for complex problem solving.

Information and Communication Technology / Technical Literacy

Information and communication technology (ICT) in its traditional form refers to technical skills related to the *use* of technology[87]. However, given the advancement in technology, this term has now been used to understand technological *literacy* in a much broader sense. For example, ICT could refer to the *use* of digital technology, communication tools, and/or networks to *understand, evaluate, integrate,* and *create* new information[29]. While ICT and technological literacy are both used within the literature, the US government defines technological literacy as the capacity to use, understand, and evaluate technology as well as to understand the technological principles and strategies needed to develop solutions and achieve goals [88]. Therefore, there is a key difference between the meaning of ICT literacy and that of technological literacy, as technological literacy highlights the inter-dependence of technology and society. Furthermore, technological literacy in the 21st century is not only required to interact with networks, but an understanding of the technological principles is also needed to solve complex problems.

**Foundation Skills and STEM**

Foundation skills include both cognitive and manual skills, such as learning, literacy, numeracy, coordination and refined manipulation skills. All job tasks require some level of learning, reading, writing, oral communication, numeracy or physical ability and acquisition of these skills is usually gained in early education.

Building on core foundation skills, STEM literacy (Science, Technology, Engineering and Mathematics) entails further refinement of cognitive foundation skills. As such, STEM literacy is a key skill in cognitive non-routine job roles. It has been purported that with the focus on 21st century skills gaining momentum, there is a risk of developing generalised skills in the workplace at the expense of foundation and STEM skills. Although 21st century skills such as collaboration, creativity, and critical thinking will be key for the future of work, it is important to recognise that STEM skills support the ability to engage 21st century skills in a meaningful and effective way. For example, research by PwC[28] showed that increasing STEM capacity supports innovation, productivity, and competitiveness. Therefore, as technology and globalisation continue to advance, foundational and STEM literacy will be key in addressing growing uncertainty via technological innovation and scientific research and are key building blocks for MAPNet's mastery skills.

The increase in demand for STEM literacy is highlighted by the ABS' estimation that STEM related jobs in the professional, scientific, and technical services will have increased 10.2% by 2023[89]. Furthermore, a major contributor to the estimated growth in the professional, scientific and technical services comes from an expectation that the Computer System Design and Related Services sector is projected to grow by 15.6% (or by 37,700 people) [89]. Currently, despite heavy government promotion for STEM careers, major skill shortages are already being reported[90].

# SUMMARY

## MAPNet: UNDERSTANDING THE FUTURE OF WORK

The nature of work is changing. While this is not a new phenomenon, the rate of change being driven by exponential advances in technology is continually and significantly impacting modern work.

Calls for research to identify critical skills for the future have led to a relatively consistent list of broad skills from critical thinking to STEM. However, a reactive approach to work design and selection and training is inefficient in today's unpredictable and connected world. The Future of Work Institute's MAPNet framework argues for a systematic understanding of the future of work skills and their development in order to realise the growing possibilities across broad sections of our society. MAPNet provides a new way of thinking about skill and lifelong learning based on the deep structure of work activities. The MAPNet Framework allows us to examine more specifically how individuals' skill sets contribute to the two key challenges of increasing uncertainty and connectedness, as well as the conditions and systems that are needed to develop and support these skills.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