

# Plate Spinning

*A Beginner's Guide to  
Surviving and Thriving as  
an Engineering/Science  
Academic*

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# Preface

A majority of academic staff in western Universities arrive at their first academic position following the established progression from undergraduate to postgraduate and likely some postdoctoral study. This route prepares new academic colleagues well for executing research and elements of teaching but falls desperately short of the preparation required for modern academia. Often newly appointed academics will face a steep learning curve as they adopt the many functions required to succeed in their new role.

The challenges placed upon newly appointed academics are tremendous. The struggle for credibility in research whilst balancing a teaching and administration role, in addition to managing an often-young family, is significant. Meeting early career challenges to move towards research leadership is perhaps the most difficult stage of the modern academic career. This document focuses on structuring research group/vision by taking a strategic approach and thinking as a CEO of a small

enterprise while defining a vision and constructing a pathway to achieve that vision. The article also provides perspectives on measuring success, the importance of people in growing an academic *tree*, valuing and maintaining health and the importance of targeted training.

This document is intended as a frame of reference and a quick-start guide for new appointees in Science and Engineering to make sense and success of their first five years following appointment. The secret recipe for rocketing to a professorial appointment will not be found in these pages, but key points and strategies which benefited the authors forms the basis of discussion – these can also be viewed as *“I wish I was told this when I started”*. Where evidence beyond the anecdotal is available and substantiates claims made to this effect, they are presented. These have been selected from useful resources, which may provide useful further reading.

## About the Authors - Siddharth V. Patwardhan



Siddharth and Adam, while still learning the trade, have enjoyed some success in their teaching, administration and research. Their progression has been full of misadventures, failings, good/bad luck and lots of hard work. They have compiled this document to help new appointees to academic roles in science and engineering (and their managers) to obtain the correct balance of the aforementioned.

Siddharth, a Professor at the University of Sheffield, leads the Green Nanomaterials Research group ([www.svplab.com](http://www.svplab.com)). Applying the excellence in green chemistry to nanomaterials manufacturing, the group is currently commercialising novel sustainable materials suitable for diverse applications. He is a Fellow of the EPSRC and a Fellow of the Royal Society of Chemistry and a recipient of multiple awards including the *Dedicated Outstanding Mentor* award four times, *“SuperVisionary”* award twice and *Teaching Excellence* award twice. Siddharth is the Founder and Director of SiPat Consulting and Training ([www.sipatconsulting.com](http://www.sipatconsulting.com)).

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Adam, a Professor at the University of Nottingham, is an expert of manufacturing technologies used in the processing of robust engineering materials. He holds a Rolls-Royce/Royal Academy of Engineering Research Chair at the University of Nottingham. During his research career, he has undertaken research Fellowships at the University of Tokyo, Rolls-Royce and the High Value Catapults (AMRC/MTC). His research investigates 3D printing and aerospace manufacturing/maintenance technologies. He has a strong passion for the development of staff and helping people reach their potential. Adam is a Co-Founder and Scientific Advisor of Texture Jet Ltd ([www.texturejet.com](http://www.texturejet.com)).



# Modern Universities and Academic Appointments

# Modern Universities and Academic Appointments



If we wanted to describe ‘Universities’ in a single word, then we would say *knowledge* (its creation, translation, transfer and exchange). The people at the frontline of delivering the knowledge “product” of the university are the academic members of staff (aka *academic* or *faculty*). Their main role is to contribute/create new knowledge for the benefit of the society and the economy, and distribute it effectively.<sup>1</sup> A significant proportion of this outcome will be via training people who go on to have long and productive professional careers. The returns on purely academic endeavours are diverse, difficult to quantify (especially in monetary terms) and are often realised in the long term.

Academics get paid to pursue their own ideas and foster the next generation. Consider this as a privileged job where “you get paid to read, learn, and grow intellectually, socially, and professionally, all while working alongside enthusiastic, talented and hardworking young people”.<sup>2</sup> We get to pursue our

own ideas and foster the next generation. In return, we need to serve the institution by contributing to a range of other roles/tasks given below.<sup>3</sup> Thus the job is rewarding and satisfying, yet can also be frustrating and exhausting physically and mentally as we wrestle between competing demands.

The process of recruiting academics is costly and risky for both the candidate and the department.<sup>4</sup> The costs are associated with the candidate moving to the new place/city/country (at times with their family) causing temporary disruptions, while the recruiting department has a direct cost arising from the salary and start up package. The candidate is risking their future/career by taking up a particular position, which may or may not work out. Similarly, as the candidate has not proven independence and abilities to teach, the department is taking a risk and recruiting candidates on their potential rather than direct experience. The opportunity cost of both parties making a poor judgement at

this juncture is tremendous. Hence it is essential to get this right. As discussed below, an important aspect for the candidate here is to be clear on what they themselves want and why, what the institution wants, and how well these respective interests align.



## 1.1 Changing times

Higher Education is going through a period of transition as institutions seek to uphold traditional values and approaches while delivering at scale. There is a need to rebalance between large class

sizes (income from fees), associated changes in the quality of incoming students and creative knowledge creation (freedom from running “supermarket institutions”<sup>1</sup>). An academic’s job involves multiple responsibilities simultaneously including:

- a fundraiser,
- a manager,
- a teacher,
- a mentor,
- an inventor,
- a leader

amongst others.<sup>3,5</sup> There is an increasing demand on academics to take on new tasks, which were traditionally viewed as outside the scope of an academic, including:

- pastoral care,
- administration,
- providing data for managers,
- commercialisation and
- “impact” delivery.<sup>6</sup>

Balancing these roles, while managing people and projects can be daunting at the beginning since

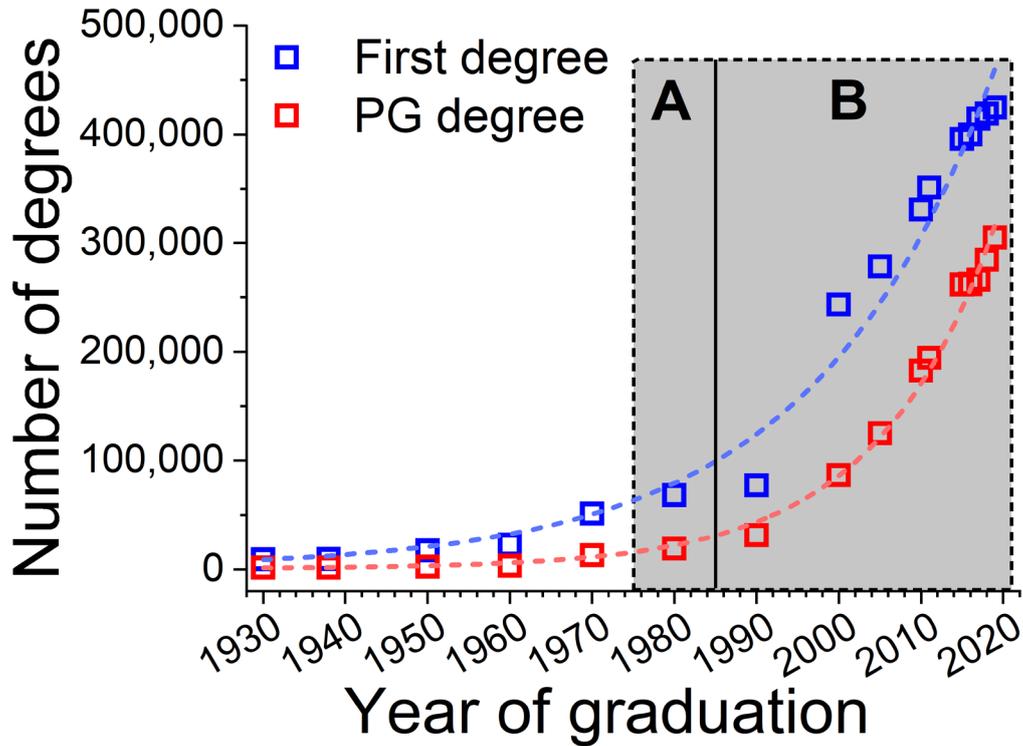
most new academics have had very little formative training outside of research.

Accomplished colleagues acting as mentors today may have begun their academic careers in 1980s and 1990s. Universities have changed dramatically since this time. Within the UK, the nature of universities, the funding models and student fees have changed more than once. This means that what “worked” to succeed in earlier years does not necessarily apply today. The pressures that new appointees are placed under are distinct and the job has changed beyond recognition. The student numbers alone have exponentially increased (see *Figure 1*). The advent of REF and TEF, and replacing HEFCE, the body that worked with universities, with the Office for Students – a regulating body are some key changes. Similar changes of different nature and intensity have also occurred in other countries.

In order to fit well and succeed, it is important to know how your University operates, what does it value, what are its ambitions and strategic plans,

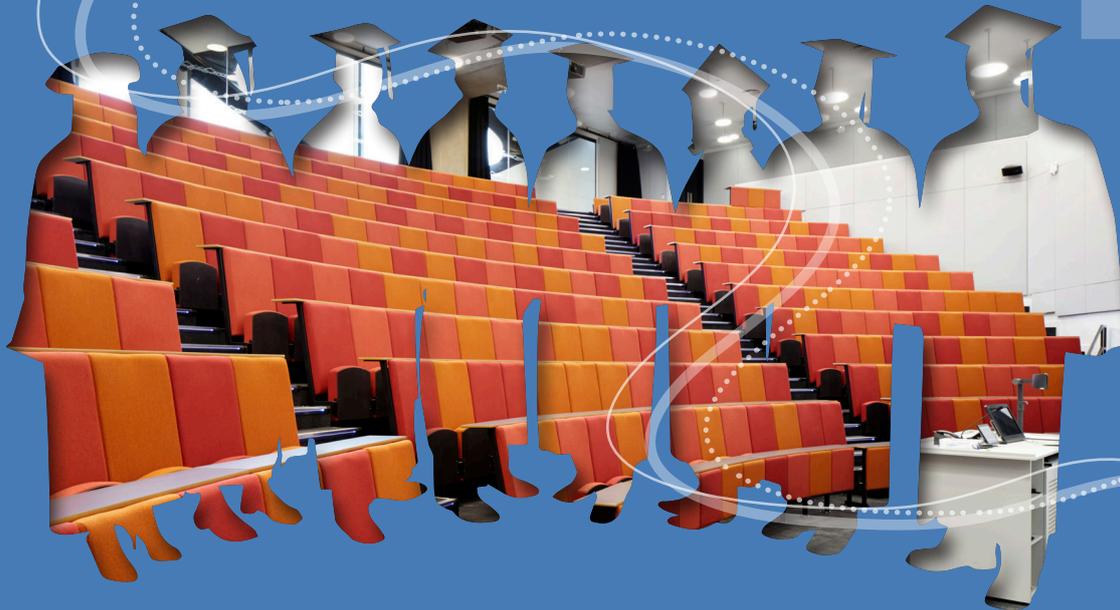
and how does it meet its costs. These attributes will help us tailor our vision and operations (described in section 3). Given the changes to the academic role, behaviours have been identified which are important for success, as described by Mabrouk.<sup>2</sup> They are listed below and we will return to them throughout the article:

- **Network well** – socialise at workplace, build a support network (internally within your department/university and externally) and find suitable collaborators.
- **Multitask efficiently** – learn plate spinning (not literally!), practise switching from one task to another within a day, learn to manage multitasking.
- **Manage effectively** – learn to manage others, projects, finances and yourself.
- **Maintain balance** – for physical and mental health. Be positive, learn to relax by spending time outside work (e.g. sports, family, hobbies).



**Figure 1.** Number of degrees awarded in the UK each year. The dashed lines show exponential trends with excellent fits ( $R^2 = 0.98$  and  $0.99$  for first and PG degrees respectively). Data obtained from <sup>7,8</sup> where region 'A' may refer to the training period of a senior colleague who boasts 30 years of experience in region 'B'.

# Teaching teachers



## Teaching teachers



Teaching an entire module or course for the first time can be overwhelming. This is because we have to think about defining the syllabus, creating the content, pitching at the right level, delivering for large cohorts and managing student expectations.

These aspects are clearly crucial for educating students and they have become more important because, in most universities, students evaluate their teachers, and moreover, these evaluations feed into probation and promotion of academic staff. It is worth noting that such evaluations by students may not be an accurate way to rate a teacher<sup>9</sup> because results from a recent study has questioned their validity as measures of teaching quality or effort.<sup>10</sup> That study found that student evaluations rather reflect the students' enjoyment of the course and the students' perception of the teachers' value or utility (in gaining higher grades, better degree classifications, less need for exerting efforts). Furthermore, there is evidence that currently used

student evaluations can be implicitly biased and that alternatives are necessary.<sup>11</sup>

In the UK, there is support for learning to teach in the form of mandatory post-graduate qualifications in higher education, mentoring schemes (at department level and beyond) and from the Higher Education Academy (HEA). Given its importance, there are numerous books and papers available on this topic, including new delivery styles.<sup>12-15</sup> One aspect that we felt helped us in this area is to focus on delivery and student engagement and not just the content. Use content from previous year/teacher and develop it over the years; depth and/or breadth can be added later as appropriate. Learning to, struggling with, and eventually managing well with teaching at the same time as excelling in other roles is extremely challenging.

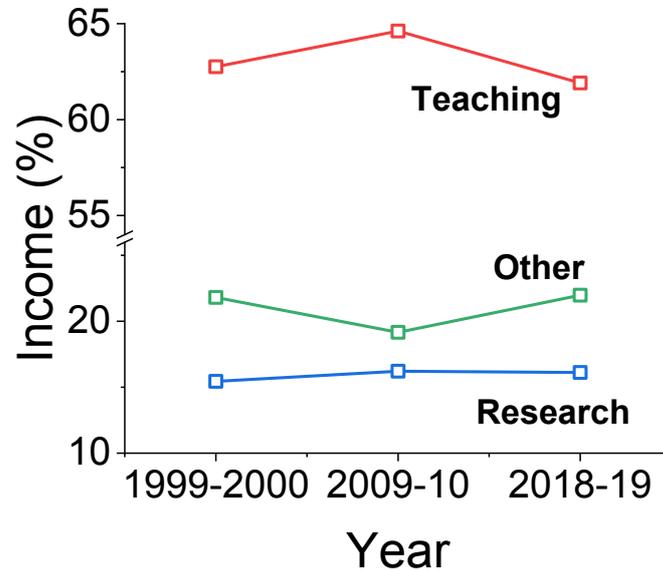
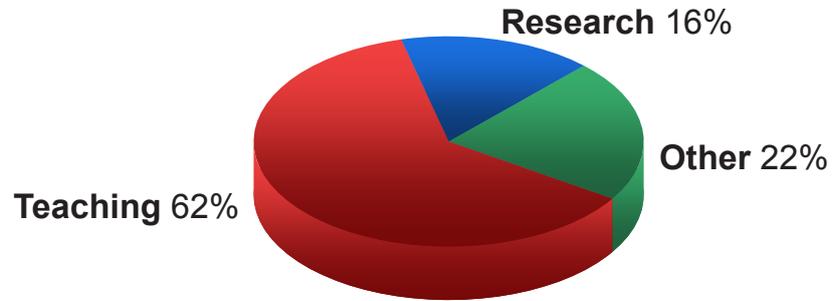
We have seen colleagues treating teaching as something that comes in the way of research,

an impediment as opposed to an essential accoutrement for the well rounded academic. When we consider the breakdown of incomes for most universities (see *Figure 2*, right), it becomes clear that the majority comes from teaching (via student fees and block grants for supporting teaching). Further, looking over two decades, this breakdown has not changed, when averaged over the entire UK (certainly, there will be differences at the level of each institution). So if anything, teaching has and will continue to *allow* us to do research. Having said that, it is common to feel that teaching is taking far too much time and the time needed for building a successful research group is diminishing. This feeling is not helped by the fact that while funding comes from both teaching and research, many universities actually emphasise research over teaching in promotion/tenure. This is further amplified by the fact that research (and funding) is increasingly becoming more and more competitive, thus requiring more time to achieve the same outcomes as 10 or 20 years ago. This is where the “Ruthless Compassion” approach seems an excellent way to satisfy these competing demands.<sup>16</sup> It advises that we need to be ruthless and strict in

how we invest our limited time and resources for teaching to maximise the benefits for students.



**Figure 2.** Average income of HE providers in the UK broken down as teaching (fees and grants), research (grants and contracts) and other (including returns from investments, and income from donations and endowments). (Top right) Average over all HE providers in the year 2018-19.



(Bottom right) The trend over years, averaged over all HE providers in the UK for that year. Number Data obtained from Higher Education Statistics Agency, <https://www.hesa.ac.uk/data-and-analysis/finances/income>, accessed in June 2020.

3



# Baking an Impactful Research Cake

# Baking an Impactful Research Cake



This section will focus on ways to structure a research vision and making arrangements accordingly. There is a big difference between *doing* research as a PhD student and a post doc under the watchful eye of a lead investigator, and *leading* a research activity. Understanding this difference, learning what is required for this change and managing the change carefully can result in a rewarding journey. We suggest that all those who have some inclination (even if small) to become an academic, should focus on aspects given below. A key benefit is that individuals will get a flavour of the job, which will help them consolidate their ambitions – either entering or exiting academia, both being equally important. From our experience, there are key elements to baking this research cake listed below, which are discussed later:

1. formulating a long term vision and finding a niche,

2. gaining clarity on aims and how to measure their success,
3. strategic use of the important tools and mechanisms to reach the aims and vision,
4. selecting the most suitable people (group members and collaborators),
5. executing these in a sustainable fashion such that you avoid zombification within ten years of starting the job.

## 3.1 Vision

One of the main attributes that helps get selected for an academic job from a set of highly qualified and experienced researchers is a long term vision or a big picture view.<sup>17</sup> This includes defining:

- what your research (and you) will be known for in ten years?
- what will your research group be called?
- what problems you will solve (for community, society and/or industry) and what are the key challenges you will be addressing?

- what new advances you will discover?
- what are your uniqueness and niche in the field?
- what will being successful look like and what would that mean to you and others?
- who will be interested in your research apart from your academic chums?

When answering these questions, it is important to look at long term goals and think beyond a single project or a single PhD activity. A good starting point is to consider your scientific expertise and contributions you have made thus far. Identifying your unique skills, experiences and background is helpful. These could be wide ranging, e.g. educational background, which brings together a unique set of areas, or diverse experience with *tools*, that creates a niche for certain applications/sectors. This is the foundation and one should spend considerable amount of time to generate ideas, validate them and refine them – this can take several months to years. Rushing to a vision that is an extension of our own PhD project or the most recent project can lead to something that others view as “too incremental”.<sup>18</sup> A new academic appointment is an excellent opportunity to pursue an

entirely new avenue of research and begin afresh by applying your unique skills.

### **3.2 The research group as an enterprise**

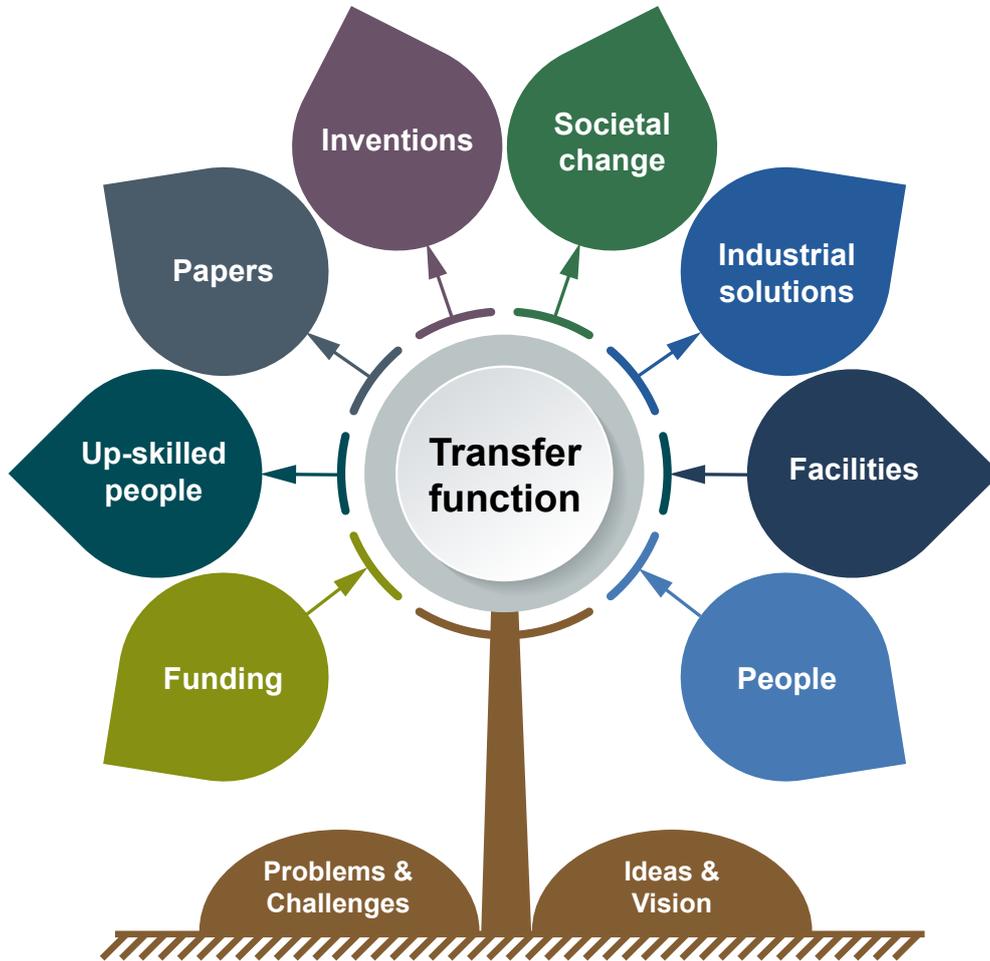
In order to help build this vision and test its potential, we consider out of the box thinking by proposing that academics should think of building and running a research group as a small company (a small and medium scale enterprise, SME) within the University’s infrastructure and environment. The emphasis should be placed on strategic management of vision/career. We had a positive experience of applying this concept in our own careers and received encouraging feedback from colleagues with whom we discussed this.

Within this concept, academics are considered as the chief executive officer (CEO) of their SME (research groups). They identify the aims/outcomes/“products” of their groups, which include papers, inventions, impact and most importantly, up skilled/educated people (including self) in the form of graduates, PhDs, engineers and scientists (see *Figure 3*). Inputs and tools required to achieve those products are then considered. Each

academic identifies, develops and refines their own mechanism (the academic *transfer function* in *Figure 3*) to convert a vision into products. The ability to identify inputs, outputs and mechanisms to formulate the transfer function is what is attributed here as entrepreneurial elements, which are required for building an exciting research plan. We note that for the sake of presentation and explanation, *Figure 3* is a simplification of the academic transfer function, which in reality is complex with varied timescales of outcomes (as described in the introduction). There are several multi layered pathways, structures and dynamics contained within the academic transfer function.

Having described what it is, let us see what the limitations are. The concept is proposed for the sole use of developing a strategic vision and therefore it does not necessarily extend to management styles and daily operations because academia and business worlds are fundamentally very different. It is important to make it clear that the CEO analogy is not trying to encourage financial mind-set, rather quite the opposite by putting funding aside and helping to focus on what the academic aspires

(further explained in section 3.4). Noting the aims and the tools improves clarity and helps build a strategy to attain the vision. For example, clearly identifying funding as an input (not an output) needed to achieve the goals helps focus on the scientific advances we wish to make. We have often seen new academics too focussed on funding that they can lose the sight of research goals. Becoming too focused on the process as opposed to the deliverable can result in catastrophe. An easy way to identify this confusion is to ask what is stopping you from achieving the vision and consider if you are given £1m tomorrow, what will you do and what will you achieve? Populating the *roots, stem, branches, leaves, and fruits* of this academic *tree* shown in *Figure 3* enables focus and identification of missing attributes that can be gained via targeted training. While a huge grant win may be desirable, is it really the element, which is preventing you from executing your research plan?



**Figure 3.** A simplified schematic showing the components of an ‘academic tree’, what are the inputs needed for nurturing and growing “products”. Each academic identifies, develops and refines their own mechanism (the academic transfer function) to convert a vision into outcomes.

Once we have developed a vision, articulated a strategy and defined each aspect of academic enterprise model (the *tree* shown in *Figure 3*), the vision and strategy can be tested. This can be achieved by performing analyses of the research vision using various tools. They include risk analysis that we are generally aware of, analysis of our Strengths, Weaknesses, Opportunities and Threats (SWOT), Failure Mode and Effects Analysis (FMEA) and Political, Economic, Social and Technological (PEST) analysis<sup>17</sup> – such analyses are common in industry (see more about these tools in ref.<sup>19,20</sup>) and have started finding value in academia. In the context of research vision, we need to map it with respect to:

- the Institution’s priorities/ambitions/excellence,
- competitors (including past supervisors and former group members),
- government agenda,
- funding landscape/directions,
- international context.

These analyses should be conducted periodically, and their outcomes to be used to inform and refine

the vision. In this context, SWOT analysis can help aptly position our vision and modify, if needed, such that it is unique, robust and ready for seeking new opportunities. The PEST analysis helps map our vision in the wider context and identify areas where success of the vision is more likely due to potential trends in government/funder policies, social needs/pull in certain direction and development of technological landscape relevant to the vision. The vision can be also tested in practise during the latter stages of post doc appointments or at the beginning of academic position. This can be done by undertaking small, low risk projects, such as a UG summer project, to test the hypothesis and generate relevant test results. While FMEA is a useful tool for understanding what can go wrong and understand the implications, plans B, C, D, E and F may be required as your career develops. Again, dedicated training courses are available in this area from most universities and external consultants.

### **3.3 Branding and marketing for visibility and engagement**

It might sound absurd to think of branding and marketing in academia as being important for

academic staff. However, with the changing funding landscape and the *marketisation* of the higher education sector,<sup>21</sup> unique identity and visibility are increasingly important. Producing good quality papers is no longer enough to succeed in the competition and we need to learn how to communicate and promote effectively our research vision, the outcomes and the wider impact.<sup>22</sup>

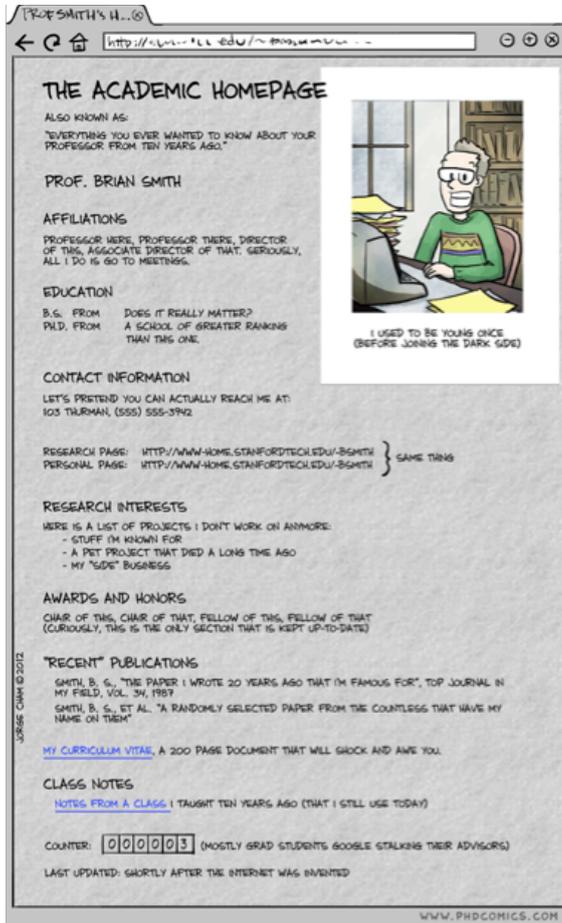
Electronic platforms are becoming a commonplace for promoting research outcomes and these include dedicated websites for research groups, social media, videos, animations, online tutorials, blogs and so on. These need to be dynamic and up to date, unlike old and static pages (e.g. see *Figure 4*).

Those *assessing* us as a potential supervisor and a future collaborator, as well as assessing our grant applications, probation and promotion cases, and presentations at conferences will be looking at these online platforms to find out more about us, so it makes sense to be visible. The use of these platforms and their suitability for a desired audience should be carefully evaluated, along with the time spent on them. Engaging with wider public has become more important and the onus of

communicating research outcomes to the general public is shifting towards the researchers. Although this may not be everyone's forte, it can be viewed as an opportunity to sharpen our presentation skills, to raise our profile and to attract talent in the future. While this may feel awkward, it is important to note that others (your competitors) will happily extol the merits of their work and themselves cum laude. Along with other mechanisms, self promotion is also viewed as an important way to make your colleagues aware of your growing professional reputation.<sup>23</sup> A common method includes providing information and stories for departmental/faculty newsletter.

### **3.4 Measuring sticks**

The probation period (aka *tenure*) is generally between 3-5 years and the outcome depends on a number of criteria. The purpose of this is to allow autonomy and convert your potential into demonstrated *value* to the institution.<sup>25</sup> First, it is important to know these criteria and fully understand them – these are provided by the department/institution. During initial meetings with your mentor or head of your department, it is important to agree

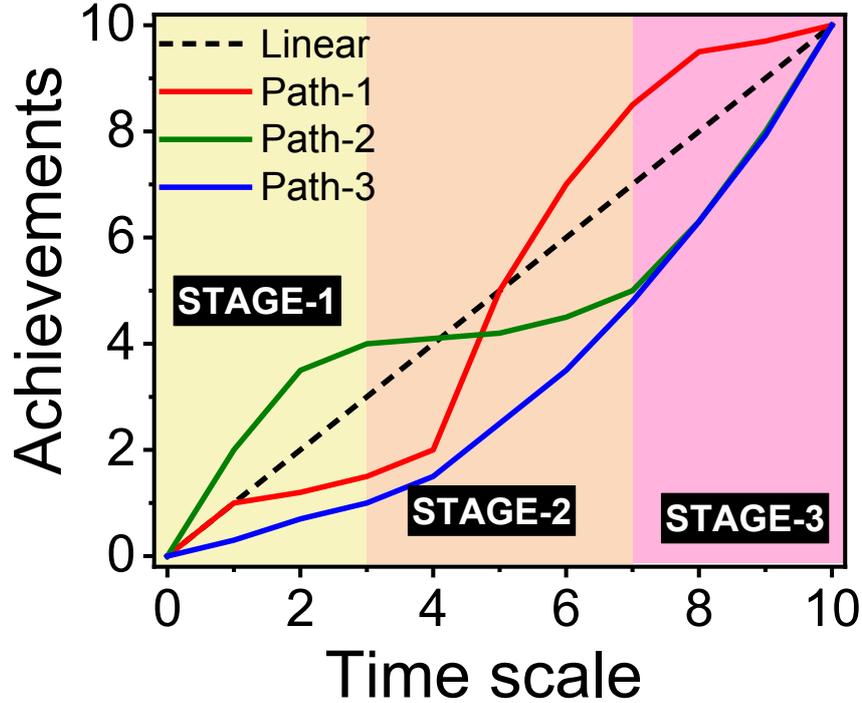


**Figure 4.** (left), An illustration of how an old and static academic webpage. Reproduced with permission from "Piled Higher and Deeper" by Jorge Cham, [www.phdcomics.com](http://www.phdcomics.com).<sup>24</sup>

and quantify the targets as well as understand how they will be measured.<sup>25</sup>

While looking at career paths, the trajectories can take different shapes as shown in *Figure 5* as three hypothetical career paths. Assuming that, in a given time scale, everyone wants to achieve the 10 out of 10 on the achievement scale (definitions are left to individuals when they set their goals), we are showing three stages. These stages represent probationary Lecturer/ tenure track Assistant Professor, Senior Lecturer/Associate Professor and Professor (who continues to move “up” into leadership of a department, a centre, an institute, etc.). When we start, we assume a linear path, which actually is less common because real careers have real (non-linear) “ups and downs”. Each person experiences very different trajectories and this is an important point to appreciate because it leads to less anxiety and frustration from a direct comparison with someone and more personalisation/ownership of our journey. Naturally this trajectory is also subject to factors external to work, some of which will rightfully demand your attention.

The differences in paths occur for reasons such as personal circumstances (e.g. family responsibilities, background, knowledge of the sector and the country, etc.), start-up support (cash, equipment, lab, mentoring, ...), environment (local, national and global) and sometime statistics (or “luck” or unidentified reasons). As a result, some people can start linearly, face challenges, recover and catapult (path-1 in red line). Others can experience the exact same attributes but in a different order (path-2 in green line). The trajectory in blue line represents one of the authors’ journey – slow/delayed start, leading to small success, which boosted further acceleration. As such, although each path leads to the same destination in this scenario, comparing them at time points 3 or 6 can provide striking differences.



**Figure 5.** Schematic representation of career trajectories. Note this is not to scale and for ease of comparison, the end-points are the same. Axes numbers are arbitrary and do not relate to years or outputs or impact. Individuals are encouraged to define these for themselves.

Looking closely at each stage, there are certain attributes associated and rough measures for them as shown in *Table 1*. Although these will vary between individuals, institutions and situations, we present a flavour for each stage. Stage-1, which is in a way *the battle for credibility*, is the first and perhaps very challenging stage.



This is where we are trying to fit in, prove ourselves, gain traction, create a positive reputation, learn new skills and likely worry about the probation/tenure. For a “common” route (PhD, then post doc and a first independent position), people may have young families, which also adds to the *battle* – managing many things at work and home *for the first time!*

This leads to many unintended consequences and we strongly advise people to seek help from colleagues, mentors, family/relatives, peer network groups and specialist training (discussed below). At the end of this stage, it is expected that individuals would have passed probation by accumulating publications, grant(s), supervision and teaching attributes. They would have proven their independence, vision and fit to the department and as such would now be “allowed” to consolidate in Stage-2, which we lightly call “wilderness years” which in turn gives way to senior leadership in Stage-3. Given the focus of this article on starting in academia, we will not discuss Stages 2 and 3, and encourage readers to explore them via *Table 1*.

	<b>STAGE-1</b> <i>The battle for credibility</i>	<b>STAGE-2</b> <i>Wilderness years</i>	<b>STAGE-3</b> <i>Senior Leadership</i>
ATTRIBUTES	<ul style="list-style-type: none"> <li>• First independent publications</li> <li>• First independent funding</li> <li>• First leadership in engagement with collaborators</li> <li>• Teaching an entire module</li> <li>• Introduction to Admin tasks</li> <li>• Management</li> <li>• Learning and consolidating niche</li> <li>• The ‘final filter’</li> </ul>	<ul style="list-style-type: none"> <li>• Steady publications and grants</li> <li>• Growing a team</li> <li>• Developing a reputation (and likely an ego)</li> <li>• Developing leadership and influencing others</li> <li>• “Am I a manager or a researcher?”</li> </ul>	<ul style="list-style-type: none"> <li>• Leading a large team or theme</li> <li>• Likely significant University responsibility</li> <li>• Consolidated funding and esteem</li> <li>• Recognition by learned societies</li> <li>• Thought leader, strong mentoring profile.</li> <li>• Solid evidence of delivering impact</li> </ul>
MEASURES	<ul style="list-style-type: none"> <li>• 2-20 publications since appointment</li> <li>• May have held a grant</li> <li>• Typically a reduced teaching load</li> <li>• Light admin duties</li> <li>• PhD student (or two), perhaps a researcher</li> <li>• Normally working as part of group and supported by others</li> <li>• Sometimes still to define a research portfolio</li> <li>• Probation?</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;20 publications</li> <li>• Standing in learned societies/ journals/ committees</li> <li>• 4-5 PhDs complete, 1 PhD student intake/year</li> <li>• Stock relationships</li> <li>• “Stable” ~£100-200k annual grant income with <i>big</i> grant(s) (~£1m)</li> <li>• Utility beyond own teaching and research</li> <li>• Leading academic committees/ portfolios</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;£200k pa grant income</li> <li>• Established relations with industry</li> <li>• Leading large teams and grants (&gt;£1m)</li> <li>• Many PhDs graduated</li> <li>• Publishing high quality at a high rate</li> <li>• Leadership of learned societies/ external committees</li> <li>• Invitation to Head a department/ centre/.</li> </ul>

**Table 1.** Attributes and rough measures of career stages. Note this is not exclusive and we expect variations between individuals, institutions and situations.

### 3.5 They who pay say

One of the key inputs required to achieve the research goals is funding. It is important to reiterate that funding is a means to an end, and not the aim in itself. Ample funding does not guarantee high quality papers or inventions. However, funding is easy to measure and hence at times it has been given disproportionately high importance when measuring success.

There have been mathematical and statistical analyses of success of grant applications (see for example ref.<sup>26</sup>) with recommendations on how to strategically select opportunities. For example, it has been estimated that submitting two applications per year to a funding body with ~20% success rate would result in only 26% of applicants failing to obtain any funding over a three year period.<sup>26</sup> However, submitting only one application per year would lead to half of the applicants not receiving any funding after three years. The implication of this is staggering and hence very important to plan a strategy. What is important is to keep focus on the scientific and career goals and plan for multiple funding mechanisms in order to diversify sources

and sectors/areas of research. This, unfortunately, is directly the opposite of the advice one of us have received – diversification was discouraged and focussing all efforts on one area and one scheme from one funder was strongly recommended. This highlights that at times mentors or those in decision making positions can overlook (1) the recent changes to the funding landscape/rates and (2) the differences in efforts required (and the success rates) between new starters and seasoned *players*.



It is also important to consider how to take a staged approach from seeking funding for a short and narrow project to build track record and then moving

to larger pots. In doing so, specific scheme relevant to those “stages” would be useful. This strategy can minimise the risk of being unsuccessful and wasting too much time because for new starters, it is easier to write focussed applications with good clarity and they are viewed less risky for the funder. Further, obtaining early success also ensures future success (even in mid- to established career stages) according to the “Matthew effect” where earlier grant success leads to much higher chances of winning funding in mid career.<sup>27,28</sup>

We have found that the key aspects of securing funding include a genuinely novel idea, clarity in vision, its articulation and wider benefits, and a well thought-out plan. There is certainly an art in writing grant applications and there are many resources available for guidance, including training courses within universities and those run by external agencies.

### **3.6 The most important ingredient**

People within our research groups are the most valuable (and expensive) assets, even more than equipment. Consider that it costs £60-80k per year

for a post doc (and associated overheads), while a “major” equipment will cost say £100k over its life of 5-10 years ( $\approx$  £10k-£20k/year!). Thus recruiting, managing, mentoring and developing people is extremely important. On a longer time scale, our success as academics is measured by the success of our group members and not just by papers and funding. So, care must be taken while recruiting new researchers. We need to consider how to attract good candidates and why will they join our new lab. Sometimes we need to consider candidates’ attributes beyond publications, such as resilience (see more in section 4 below) to overcome challenging situations at work or in extra-curricular activities. The opportunity cost of making a poor appointment at an early career stage is tremendous and to be avoided. Perhaps involving a senior colleague in the selection process will help mitigate some risk here.

Beyond the research group, we will be working with colleagues and collaborators within our department (and beyond). It is therefore valuable to polish/learn people-skills such as communication, professionalism, networking, being a team-player,

etc. Training can be useful on these aspects and also in handling difficult situations including conflict.<sup>29</sup> So, what is such networking useful for? Networks can be divided into three categories<sup>17</sup>: operational, strategic and personal. Those in the operational network help us manoeuvre daily activities, understand “how things work” and find key contacts. Next, we need mentors, who can help us with research vision, mechanisms, contacts, strategy, etc. They are our critical friends and sounding boards, who can listen as well as constructively challenge our thinking. It is very valuable to have at least an internal and an external mentor. Finally, those in the personal network help us develop our non-technical skills, compare notes and at times provide emotional support. They also help us to write papers like these.

### **3.7 All the gear, only some idea**

Research sponsors recognise that top-flight research is expensive. Great people are expensive and so too are the tools that some of these researchers must use. This might be the latest computational suite capable of  $1 \times 10^x$  calculations per second or it may be the latest machine which

goes ‘ping’,<sup>30</sup> but we may consider ourselves disadvantaged if we do not have them. From the outset, accessing equipment will be a challenge. Those who started their first academic appointments around 2010 in the UK have been particularly affected by the changes in EPSRC’s rules around not fully funding equipment over £10k – this has significantly disadvantaged new starters because they are yet to make the connections needed to either secure access to shared equipment or convince their departments to provide cash support to buy new instruments. Generations of early career academics have employed the tried and tested Beg, Steal, Borrow (BSB) philosophy! This is highly dependent upon building a network internally and externally of colleagues who will provide support. Often asking about the unique set of apparatus can be an excellent way to begin a collaboration. The authors have found that sharing equipment, providing support to projects where equipment has been purchased or engaging with equipment manufacturers have been excellent ways of securing access. Securing access to equipment and minimising access costs is an essential element for the entrepreneurial academic to master.



# The Tortoise and the Hare



# The Tortoise and the Hare



It is common to feel at the beginning that this is a race and hence working very long hours, without breaks, can lead to a successful career. However, if workload is not managed adequately, it can lead to burnout within a short time frame (e.g. in 5-10 years from starting independent career). It is important to consider that burnout is not a sustainable way to a successful career over 30-40 years of our working life. It is therefore very important to learn and master how to structure our daily, weekly, monthly, annual and longer term activities. Using regular planning and reflection, taking time off, learning how to say 'No', looking after our health and asking for help from others are some ways that help get the balance right.<sup>31</sup> This is important to manage as "there is now strong potential for role overload and role ambiguity which can be unsettling,"<sup>6</sup> leading to frustration, stress, *free* labour,<sup>32</sup> *emotional* labour<sup>33</sup> and other mental health issues.<sup>34</sup> There are many self-help books and training courses on this topic and hence this is not discussed further here.

Institutions and departments should also make work allocations fair and transparent by using a work allocation model (WAM) that is tailored for local situations (needs, ambitions, resources, etc.). As starting academics, it is important to find out about this at the application/interview stage as well as once joined. In particular, it is important to obtain clarity about various roles/tasks, especially administration as this is typically new to starting academics. A good WAM will include most, if not all, key aspects of our roles and not just one aspect, such as teaching. For an example, see a good and functional WAM developed by colleagues from the Department of Chemical and Biological Engineering at the University of Sheffield.<sup>35</sup> This WAM considers:

- the number of students in each module,
- the number of credits of the module,
- the number of research and other student projects supervised,
- hours allocated to research contract,

- the number of PhD students supervised,
- formal administrative roles,
- allocation for time spent on citizenship activities not accounted for elsewhere, and
- allocation for research business development.

Although, this model is under constant revision based on feedback, it has allowed the allocation of teaching and administrative tasks (not measuring outcomes) in a fair and transparent fashion, based on what academics do, rather than seniority, history, negotiating skills, etc.

Moving to resilience, which is our ability to recover from set-backs, and there will be many to come. How do we find ways not only to bounce back but also to regain the motivation is something important to learn and practice. Resilience relates to how we can maintain wellbeing under difficult conditions/situations, while also being able to recover. Herein, we simply aim to make starting academics aware of this topic and encourage them to explore this further from experts. A useful model for understanding resilience is shown in *Figure 6*. This model proposes four key aspects to resilience: confidence, adaptability, social support and purposefulness.<sup>36</sup>



# RESILIENCE

## CONFIDENCE

- Feelings of competence
- Self-esteem
- Effectiveness in coping
- Frequency of ups and downs

## PURPOSEFULNESS

- Clarity over*
- Purpose and values
  - Direction
  - Motivation

## ADAPTABILITY

- Flexibility during change
- Coping with change
- Recovering from impact

## SOCIAL SUPPORT

- Strong network
- Build good relationships
- Getting support from others

*Figure 6. A schematic showing the Robertson Cooper model for resilience. Image adapted from ref. 37.*

A key point to add here is learning to manage rejections<sup>38</sup> (there will be a few) and not to give up (at least easily!). Consider that you and your colleagues across the country or beyond have been selected after a very tough competition. This means that everyone else is at least as “clever” as you are. This is very different to the normal distribution that we are used to, and hence it will result in more rejections (or perceived “failure”) than perhaps is our custom. This can lead to imposter syndrome, which is a widely reported phenomenon amongst academics.<sup>39,40</sup> The cause and effect remains largely unknown but the authors recognise this in themselves and colleagues. Despite our best efforts, this feeling lingers on and we need to learn to cope with it.

Coping with, and even learning from such situations is therefore very important. The value of persistence cannot be underestimated. Learn from failures to improve future “attempts”, but keep going back to the editors, funders, etc. for getting more feedback and to request reconsideration. Repackage your ideas or change the presentation/story, use the feedback to make things better and difficult to

“reject”. A study has shown that a positive attitude increases the chances of applying in future and getting funded.<sup>27</sup> Reaching the world-class status does not only require intellect, it also requires a lot of energy, focus, ability to withstand set-backs and tenacity.<sup>41</sup>

It is important to set realistic goals. As a post-doc, publishing a paper or more per year is generally not challenging. However, setting same expectations as a starting academic from a new vision or a new project is unrealistic. It is expected that in the first year or two there will be a publication output “dip” – not realising this often leads to anxiety and frustration. Hence looking to provide a proof-of-concept by the end of first 12-18 months is more realistic. This foundation will not only establish the feasibility of the vision but will also lead to a publication as well as support a grant application by offering preliminary results.

I admit  
it's getting better



# I admit it's getting better

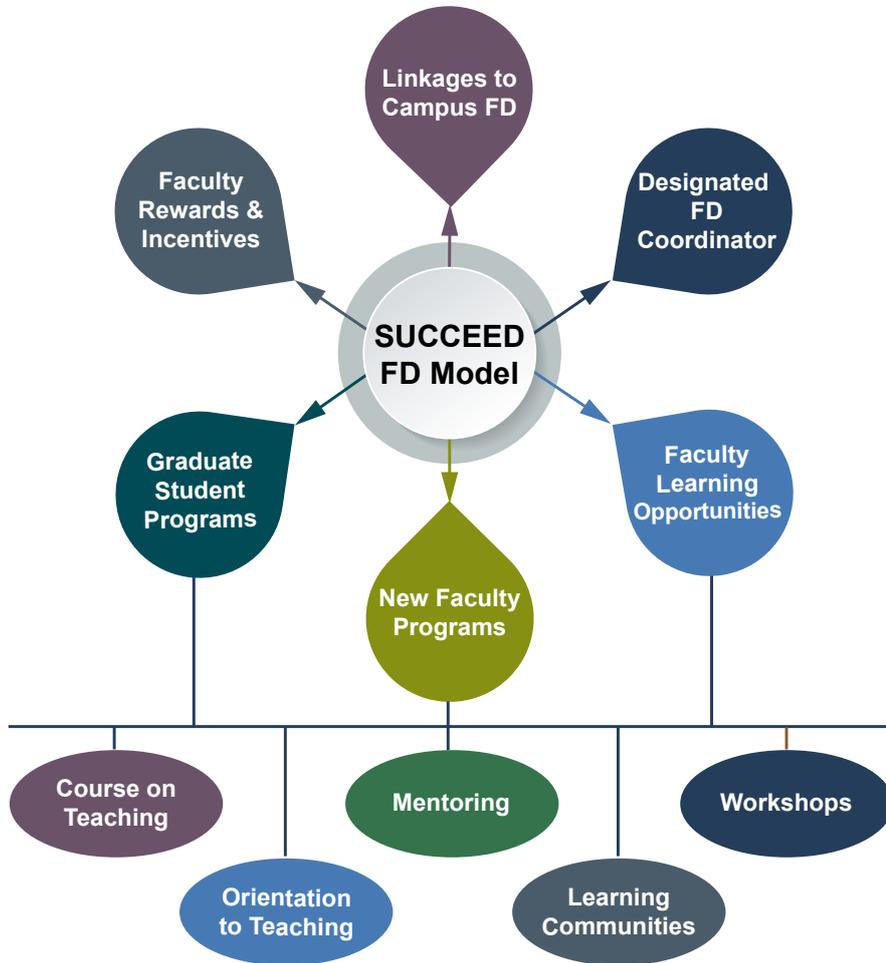


In order to manage the balance between various roles, while also making progress takes planning, organisation and training. In order to address this, a SUCCEED model for academic staff development was developed and implemented (*Figure 7*).<sup>42</sup> Making the transition from a post-doc, whose main focus is to perform high quality research, to an academic staff member, we need to learn many aspects already mentioned above.

Most of these roles are completely new for a starting academic and hence it is important to obtain dedicated training on transferable skills such as managing finances and projects, leadership, negotiation, managing a team of people with different personalities, attributes and ambitions, writing proposals and learning to teach effectively. The higher education sector has a good appreciation of training needs and as such universities run a wide ranging courses (mostly free for staff) delivered by the University or external

agencies. These include researcher development, leadership, new PI development and building commercial relationships. The time (and sometimes the money) spent on these trainings is worth it and new starters should dedicate time to identify training needs and undertake training.





**Figure 7.** Academic staff or faculty development (FD) model. Image adapted from ref.<sup>42</sup>

6

The path to  
stardom



## The path to stardom



With a fair wind, the authors intend to report on this matter in due course. Alternatively, we would be grateful if colleagues would provide instructive correspondence to the authors.

# Conclusions

Every academic career is unique – very demanding and yet rewarding and satisfying – where we are juggling many diverse roles simultaneously. We have the opportunity to shape, manage and direct our career trajectory. Based on the authors' limited experience, it is suggested that in order to excel and be happy, we need to be highly organised (in thought, vision and activity), disciplined and efficient in the execution.<sup>43</sup> While at the same time, we need to strike the balance between work and life that is appropriate to individuals and their circumstances.

## **Key takeaways are:**

- Spend time in formulation a unique and fresh vision, articulate it clearly.
- Be clear on what is expected of you.
- Discuss your experiences (good and bad) with colleagues at other institutions.
- Your Institution wants you to succeed. Help them to help you.

- Understanding your organisation is key in progression.
- In teaching, research, administration and external matters, there will be shortcomings – be someone who changes them, learns continuously and not a moaner!
- Keep enjoying your work.

The key message is we need to learn how to “work hard and work smart, network, take the time to establish a solid reputation, synergize, maintain professional and work-life balance, and do what you can to minimize stress.”<sup>43</sup>

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This document is intended as a frame of reference and a quick-start guide for new appointees in Science and Engineering to make sense and success of their first five years following appointment. The secret recipe for rocketing to a professorial appointment will not be found in these pages, but key points and strategies which benefited the authors forms the basis of discussion – these can also be viewed as “I wish I was told this when I started”. Where evidence beyond the anecdotal is available and substantiates claims made to this effect, they are presented. These have been selected from useful resources, which may provide useful further reading.

