A LECTURE SERIES FOR ENGINEERS WHO LEAD 2026

Success as an Engineer

THE COMPLETE SERIES



Set the target. Measure honestly.
Correct the drift. Close the loop.

Puranjan Gaur

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University of Ottawa
Faculty of Engineering — Capstone Design Program

Professional Practice Series

The Complete Series

Success as an Engineer

Strauss Zelnick's *Success*, carried into an engineering career

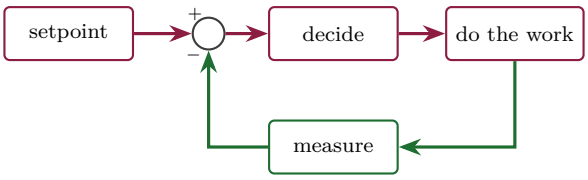
Inside: An introduction, nine lectures and a conclusion, with *The Engineer's Roadmap*, a one-page guide to the series, and *After a Failure: A Decision Chart*

Audience: Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering

Base texts: Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)

Case studies: A new case in every lecture; the Northline Programme opens and closes the series

Year: 2026



a career is a loop, not a line

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Credits

Series design, cases and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports, cited where used and listed in each part's References
Roadmap guide	Adapted from the Introduction (Figure 4.1 and Table 4.1)
Decision chart	Adapted from a reflection on failure by Puranjan Gaur (2026)

Acknowledgement

Strauss Zelnick has long made time for people starting their careers, and wrote *Success* to reach more of them than he could meet in person. He has also agreed that this series, which carries that book into engineering, may be shared freely. I am grateful for both.

Feedback

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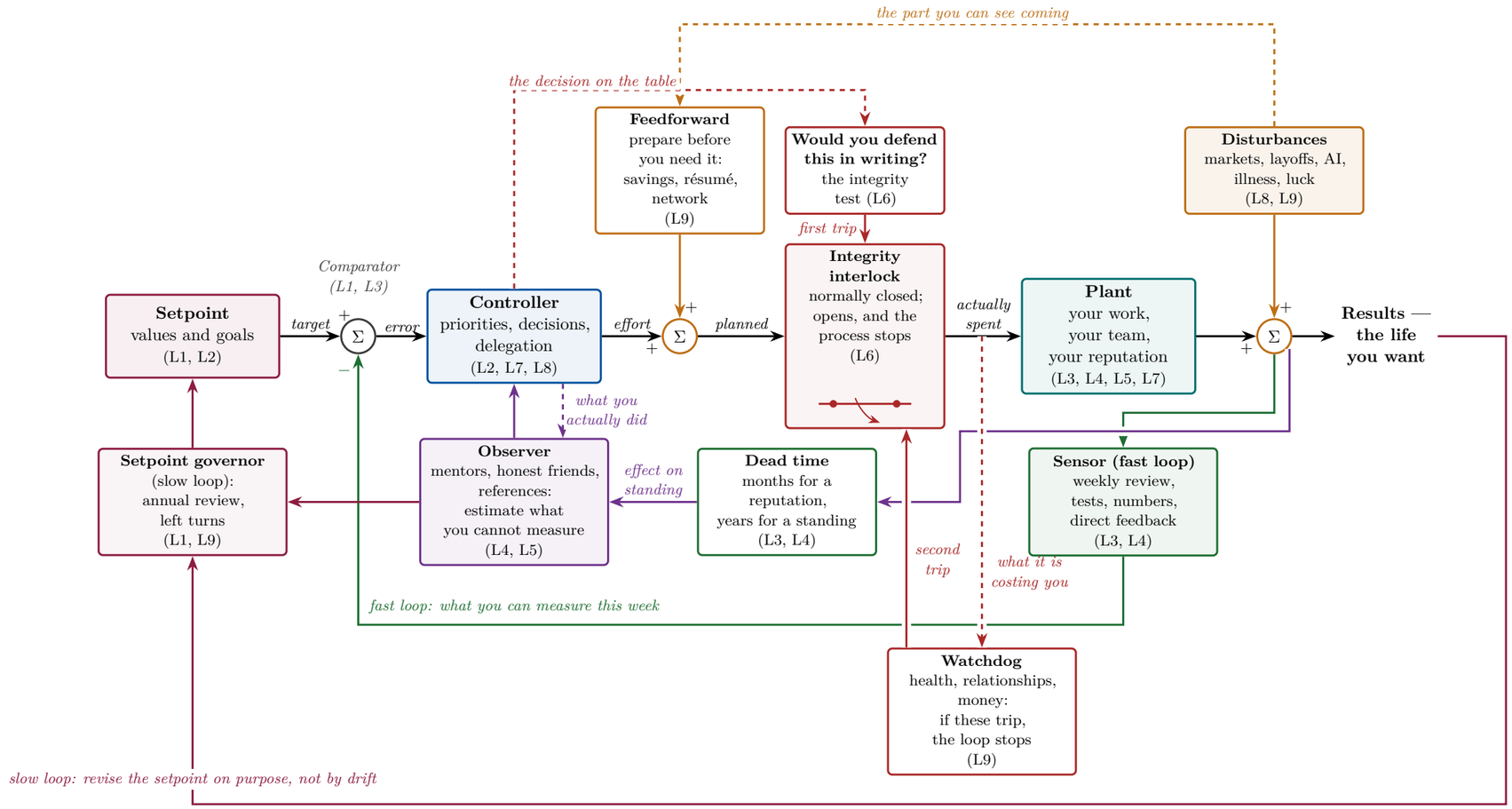
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The Engineer's Roadmap

A career as a closed-loop control system: what each block is, and the lecture that develops it

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Faculty of Engineering — Capstone Design Program
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How to read the chart

- **Forward path.** Setpoint, controller (what you decide), interlock, plant (your work, your team, your reputation).
- **Labels. L1–L9** on each block mark the lecture(s) that develop it. The blocks are separable, and each can be improved on its own.
- **Comparator.** Subtracts what you measure (−) from the setpoint (+); the difference is the error the controller acts on.
- **Fast loop.** The sensor feeds the comparator directly: what you can measure this week — tests, numbers, people telling you plainly.
- **Slow loop.** What you do reaches your standing only after *dead time* (months for a reputation, years for a standing), is estimated by the *observer* (violet paths), and revises the setpoint through the *governor* (garnet path), on purpose rather than by drift. The observer also takes in what you actually did (violet dashed line from the controller) and informs the controller.
- **Disturbances and feedforward.** Disturbances act on the results whatever you do. Feedforward acts on the part you can see coming (orange dashed path) — savings, a current résumé, a network — before the error appears.
- **Integrity interlock.** In series with everything that reaches the plant, feedforward included. It is *not* a weighting inside the controller: it is normally closed, and either trip opens it and stops the process — the *first trip* from the integrity test of the decision on the table (red dashed path running up from the controller), or the *second trip* from the watchdog, which checks what it is costing you.

The nine lectures, and every block each develops

L1 Knowing What You Want — setpoint, comparator, governor
L2 Ambition, Priorities and the Long Game — setpoint, controller
L3 The First 1,000 Days — comparator, plant, sensor, dead time
L4 Listen, Sell, Speak — plant, sensor, dead time, observer
L5 People, Politics and Resilience — plant, observer
L6 Integrity, Truth and Mistakes — interlock, integrity test
L7 From Engineer to Leader — controller, plant
L8 The Business Behind the Engineering — controller, disturbances
L9 Renewal — governor, feedforward, disturbances, watchdog

The blocks: what each one is in a career, the lecture that develops it, and where it appears in the Northline case

Block	What it is in a career	Lecture	In the Northline case
Setpoint	The written list of values and goals that says what you are aiming at, and therefore what counts as an error	L1, L2	Amara's card: emissions, family, learning, trust
Comparator	The habit of comparing where you are with where you said you wanted to be	L1, L3	Eleven months to a formal review; nothing at 90 days
Controller	What you actually do with the gap: priorities, what you say yes and no to, what you delegate	L2, L7, L8	Alarm rationalisation versus the interlock argument; later, what to cut
Plant	The part of the world your effort acts on: your work, your team, your standing	L3, L4, L5, L7	The controller firmware, six engineers, a customer's trust
Sensor (fast loop)	Short-cycle measurement: tests, numbers, weekly review, people telling you plainly	L3, L4	Test logs that disagree with the daily report
Dead time	The lag between doing the work and seeing what it did to your standing	L3, L4	The 2028 design review, and when its effects on her standing become visible
Observer	Estimating what you cannot measure directly — your reputation, your standing, how the room actually heard you	L4, L5	Two colleagues who agreed privately and not in the room
Setpoint governor (slow loop)	The annual, deliberate revision of the setpoint itself	L1, L9	2033: a raise, a family house, an election
Feedforward	Acting on a disturbance you can see coming, before the error appears	L9	Savings, a current résumé, a network
Disturbances	What acts on you regardless: markets, politics, technology, luck	L8, L9	A commodity price, a spending review, a supplier's firmware
Interlock	Constraints that stop the process rather than trading off against it	L6	The revision B report and the shipment date
Integrity test	The question that opens the interlock: would you defend this decision, in writing, to someone it harmed?	L6	Whether the Site 6 shipment is an integrity question at all
Watchdog	Health, relationships and money: slow variables that halt everything when they fail	L9	No break longer than four days since 2029; no running since 2031

Adapted from the series Introduction (Figure 4.1 and Table 4.1). Narrative framework: Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (self-published, 2015). Engineering-management content: L. C. Morse, W. J. Schell IV and D. L. Babcock, *Managing Engineering and Technology*, 7th ed. (Hoboken, NJ: Pearson, 2020). The Northline case is fictional. © 2026 Puranjan Gaur; licensed under CC BY-NC 4.0. Print on A3; for an A4 copy, the Introduction prints the chart on a page of its own.

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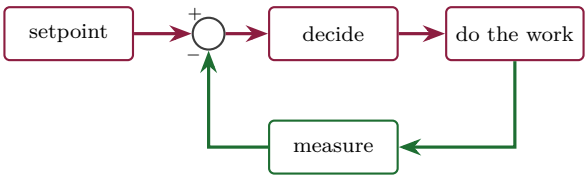
Success as an Engineer — Professional Practice Series

Introduction

The Control System for Success

How to read this series, and the case that runs through it

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Northline Programme (remote-microgrid energy storage)
Year:	2026



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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
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Chapter 1

About This Series

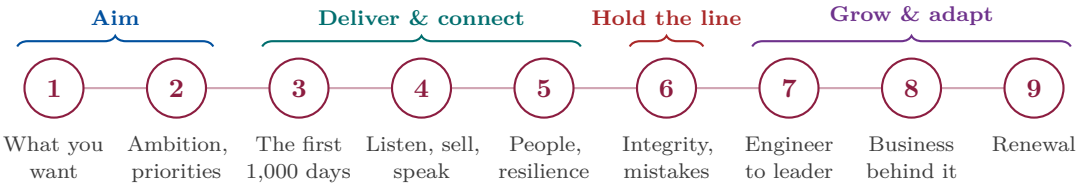


Figure 1.1: The nine mini-lectures. This introduction is the map: it sets out the sources, the framework, and one long case that every lecture returns to.

This series is nine short lectures on how engineering careers actually go, and what a graduating engineer can do about it. It is built for senior capstone students in computer, electrical, mechatronics, mechanical and software engineering, and it assumes you can read a block diagram, argue about a tolerance, and tell the difference between an estimate and a measurement.

This document is the roadmap. It does four things: it names the sources and says why they are the right ones; it introduces the author whose book frames the series; it sets out one long case study — the Northline Programme — that runs underneath all nine lectures; and it gives you the framework the series uses to organise everything else, an explicit *control system for success*.

Learning objectives

By the end of this introduction you will be able to:

- **Identify** the three kinds of source the series uses, and say what each is good for and where each stops.
- **Describe** the framework — setpoint, controller, plant, sensors, feedforward, interlock — and place any career decision inside it.
- **Name** the distinct kinds of complexity in a real engineering programme: technical, commercial, organisational, professional, community and personal.
- **Locate** each of the nine lectures on the framework and on the case, and say which question each one equips you to answer.
- **Draft** the first version of your own Personal Setpoint, which Lecture 1 develops and Lecture 9 revisits.

1.1 Three sources, and what each is for

The narrative frame: Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want* (Zelnick, 2015). A short book by a working chief executive, organised as a sequence

of instructions: write down what you want; set priorities; get to work early; listen; tell the truth; be willing to make a left turn. It supplies the argument of the series and most of its structure.

The engineering-management content: Morse, Schell & Babcock, *Managing Engineering and Technology* (Morse et al., 2020), and in particular its chapter on achieving effectiveness as an engineer. This is the textbook layer: career stages, obsolescence and continuing education, time management, professional registration, the move from engineer to manager. Where Zelnick says "keep learning", Morse, Schell & Babcock tell you what the research on technical obsolescence found and what engineers actually do about it.

The evidence: peer-reviewed research, public statistics, statutes and primary documents. Every empirical claim in the series is attached to a source you can check. The research usually confirms the advice and often adds detail an engineer can use; the **myth check** boxes test popular beliefs about success against that evidence. Where a lecture turns on a Canadian rule — employment standards, Employment Insurance, licensure — that lecture cites the government page that states it; this introduction does not, because it states no such rule.

How the three fit together

Think of them as a measurement chain. Zelnick is the *field instrument*: fast, direct, reading a system he has actually operated, and giving you a number you can act on this week. Morse, Schell & Babcock are the *bench instrument*: slower, fully characterised, built for engineers. The research is the *calibration standard*: it will not tell you what to do on Monday, but it tells you how far to trust each reading, and which one to follow when they differ.

1.2 Why this book

There is no shortage of books on how to get ahead. Zelnick's earns its place in an engineering course for six reasons.

1. **It was written to mentor.** Making time for people at the start of their careers is one of Zelnick's core values, and the book grew out of it (Section 2.2). It is advice given the way he gives it in person, to people in exactly your position.

2. **It is written from a repeated record, not a single success.** Its author has held operating roles in three different industries — film, recorded music, interactive entertainment — over four decades, each role cited in Chapter 2 so that you can check it. Advice drawn from one lucky run is a sample of one; advice drawn from repeated attempts in different conditions is closer to a method.

3. **It is a procedure, not an attitude.** It does not tell you to value clarity; it gives you an exercise. Get "the entire list down in writing"; put it away for a few days; come back and "review it brutally for accuracy and honesty"; show it to people you trust and ask for candid feedback; then find the items that are "mutually inconsistent" and resolve them. Zelnick keeps the result on his phone and reviews it "at least weekly" (pp. 26–28). That is an algorithm with a sampling rate. You can run it, and you can tell whether you ran it.

4. **It is short and concrete.** Roughly 160 pages, mostly worked examples with names, numbers and outcomes — including the ones that went badly.

5. **It treats integrity as a constraint, not a value.** "Never compromise your integrity; it's all you have" (p. 52) is presented as a limit on the search space rather than as a preference to be traded off. Engineers recognise that structure: it is an interlock, and Lecture 6 builds on it.

6. **It includes the rest of your life.** The final chapter is about showing up for people, fitness, gratitude and wanting what you have. Careers are not optimised in isolation, and a framework that pretends otherwise will give you a confident wrong answer.

Myth check: "A chief executive's advice is only for people who want to be chief executives"

Most of this book is about things every engineer does in the first year of a job: writing down what you want, choosing what not to do, listening, telling the truth when it is inconvenient, and deciding when to change direction. Where those practices have been studied, the evidence is on their side: the most extensively tested of them, writing specific goals down, is one of the best-supported findings in organisational psychology (Locke and Latham, 2002), and Chapter 4 reports both the study that found it improved students' grades and the larger one that did not. Where the context differs — Canadian employment law, an engineering licence, a new graduate's balance sheet rather than a chief executive's — the lectures say what changes, and where a course of action assumes resources not every reader has, they say that too. The advice travels well. The work the series does is carrying it across the gap between the author's situation and yours.

1.3 How the series is built

Nine lectures, each with its own case study drawn from a different engineering discipline, two to four concept chapters, discussion questions and an assignment. Each lecture stands alone. Read in order, they follow the four-part arc marked on Figure 1.1: aim (1–2), deliver and connect (3–5), hold the line when it costs you (6), and grow and adapt (7–9).

Reading plan for this document (about 60 minutes)

Chapter 2 (10 minutes) is background and can be skimmed. Chapter 3, the Northline case (20 minutes), is the one part to read carefully — everything afterwards refers to it. Chapter 4 (15 minutes) gives you the framework; Chapter 5 (10 minutes) maps the lectures onto it; Chapter 6 (5 minutes) is the pre-work for Lecture 1.

The boxes it uses are consistent across all nine lectures; Table 1.1 is the key.

Table 1.1: How to read the callout boxes used throughout the series

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Note	A practical aside: reading plans, rights, definitions.
Capstone move	One concrete thing to try this week.
Discussion questions	For class; in the lectures, always just before the assignment.
Exhibit	Case material: letters, budgets, notes, drawings, test reports.
Assignment	A task with a deliverable, a due date and marking criteria.
Learning objectives	What you should be able to do by the end; it opens each lecture.
Takeaway (shaded bar)	The one-sentence summary.

Chapter 2

The Author of the Frame

The series takes its structure from one book, so it is worth knowing who wrote it and what he has actually done: four decades of operating roles in film, recorded music and interactive entertainment, a private investment firm of his own, and a leadership role at Take-Two that has now run for nearly twenty years and is still running. This chapter sets that record out plainly, with each fact attributed, and leaves the reader to weigh it. The sources are Take-Two Interactive's own filings and executive biography, ZMC's published materials, and contemporaneous public reporting.

2.1 Strauss Zelnick: the record on one page

Strauss Zelnick holds a BA from Wesleyan University and an MBA and a JD from Harvard University. His executive career began at Columbia Pictures as vice-president, international television. He spent three years at Vestron, rising to president and chief operating officer, and four years as president and chief operating officer of 20th Century Fox, where he oversaw worldwide motion-picture operations. He was then president and chief executive of Crystal Dynamics, a games developer and publisher, before becoming president and chief executive of BMG Entertainment — first of its North American division from 1994 to 1998, then of the $4.7 billion company as a whole (Take-Two Interactive, n.d.). In 2001 he founded his own firm, ZelnickMedia, now ZMC (ZMC, n.d.-a), which describes itself as "a leading investor in and operator of media, entertainment, communications, and technology businesses" (ZMC, n.d.-a): a private investment firm whose partners take operating roles in the companies it backs rather than only financing them.

Take-Two Interactive is the longest-running instance of that model. In February 2007 the US Securities and Exchange Commission announced a settlement with Take-Two's founder and former chief executive over a stock-option backdating scheme running from 1997 through September 2003; he was *permanently* barred from serving as an officer or director of a public company, paid $6,261,606 in disgorgement, prejudgment interest and a civil penalty, and separately pled guilty to falsifying business records (U.S. Securities and Exchange Commission, 2007). At the annual meeting on 29 March 2007 shareholders elected a dissident slate; Zelnick became chairman, the board ratified a management agreement with ZelnickMedia, and Ben Feder — a ZelnickMedia partner — was named *acting* chief executive, reporting to Zelnick (Forbes, 2007; ZMC, 2007). In February 2008, under that structure, the board rejected an unsolicited $26-per-share proposal from Electronic Arts as inadequate (Take-Two Interactive, 2008), and in January 2011 Zelnick took the chief executive's office himself (Take-Two Interactive, n.d.). The arrangement has since been extended rather than unwound: the management agreement was amended on 3 May 2022 to run through 31 March 2029, with Zelnick continuing as executive chairman and chief executive (Take-Two Interactive, 2022b). Between fiscal 2007 and fiscal 2026 the company's annual net revenue went from $981.8 million (Take-Two Interactive, 2007) to $6.66 billion (Take-Two Interactive, 2026a), a figure that includes Zynga from 2022.

2.2 A commitment to mentoring

Alongside the operating record runs a commitment Zelnick treats as one of his core values: making time for the next generation of leaders. In the book's preface he writes that he never had a mentor himself, in an industry that "typically doesn't lend itself to a huge amount of coaching, or even cooperation", and that "when I started to enjoy some initial success, I vowed always to make time for others trying to enter the industry". The visitors grew from "a trickle" to "a river, which became a flood", and advising them "evolved into meeting with just about anyone who wanted to begin or improve his or her career" (p. 11). He wrote *Success* "because doing so would allow me to extend my reach" (p. 11), and in the conversational style of those mentoring sessions (p. 13). This series is one more place that reach extends to: the lectures take advice he has given many young people in person and put it to work for engineers.

2.3 ZMC: a portfolio, not a single bet

ZMC invests in and operates companies across media, entertainment, communications and technology. Its published portfolio includes Raptive (a creator-media company), Simeio (identity and access-management services), Logitix (ticketing analytics and distribution), Simpler Trading (online trading education) and The Second City, the Chicago comedy institution, in which ZMC acquired a controlling interest in 2021 (Deadline, 2021; ZMC, n.d.-b). Earlier investments, since realised, include Cast & Crew, Airvana, Tekelec, ITRenew, Naylor, Alloy, Education Networks of America and 9 Story Media Group, the children's-content studio, whose full economic interest Scholastic acquired from a ZMC affiliate and other shareholders in June 2024 (Scholastic, 2024; ZMC, n.d.-b). Take-Two appears on the same list; its management agreement with ZMC now runs to 2029 (Take-Two Interactive, 2022b).

The breadth matters for a reason that Lecture 8 develops. A portfolio is a hedge against being wrong about any single business, and the same logic applies to an engineer's skills, employers and savings: the question is never only "is this good?" but "what happens to me if this one is wrong?"

Engineering translation

What an engineer should notice about this record. Three features of this record are the subject of a later lecture. The Take-Two role began after a documented governance failure, which is the shape of a turnaround rather than a founding. The moves cross industries — film, music, games, private investment — which is the structure Lecture 9 calls a left turn. And in 2001 he moved from running a company inside a larger group to building a firm of his own. Each is a decision under uncertainty with a career-sized downside, and each has an analogue in the Northline case.

2.4 Take-Two Interactive

Take-Two is the part of the record most students will recognise. Section 2.1 gives the sequence from 2007 to the present; this section is about what the company holds.

Take-Two publishes through three principal labels — Rockstar Games, 2K and Zynga, the last acquired in a transaction announced in January 2022 and valued at approximately $12.7 billion (Take-Two Interactive, 2022a,c). Its intellectual property sits in a small number of long-lived franchises (Table 2.1):

Table 2.1: Take-Two Interactive's publishing labels and their principal franchises

Label	Franchises
Rockstar Games	*Grand Theft Auto*, *Red Dead Redemption*, *Max Payne*, *Midnight Club*
2K	*NBA 2K*, *WWE 2K*, *PGA Tour 2K*, *BioShock*, *Borderlands*, *Sid Meier's Civilization*, *XCOM*, *Mafia*
Zynga	*Toon Blast*, *Match Factory!*, *Top Eleven*, *Words With Friends*

The scale of those franchises is public. Reporting the company's disclosures for the quarter ended 30 June 2026, the trade press recorded that *Grand Theft Auto V* had sold more than 230 million units, that the *Grand Theft Auto* series had sold nearly 475 million, and that the *Red Dead* series had reached about 116 million, with *Red Dead Redemption 2* at 87 million (Game Developer, 2026; Take-Two Interactive, 2026b). For the fiscal year ended 31 March 2026, Take-Two reported net bookings of $6.72 billion, up 19% on the prior year, and identified *NBA 2K26*, *Grand Theft Auto Online* and *Grand Theft Auto V* among its largest contributors; *Grand Theft Auto VI* is scheduled for 19 November 2026 (Rockstar Games, 2025; Take-Two Interactive, 2026a).

Engineering translation

There is an engineering lesson in that last paragraph that has nothing to do with games. A company whose revenue depends heavily on a small number of very large releases has to manage schedule risk, quality risk and expectation risk simultaneously. The announced date for *Grand Theft Auto VI* has moved more than once; Rockstar has said the extra months are to finish the game to the level of polish it wants (Rockstar Games, 2025). Holding a date that the work cannot support, or moving it and saying why, is the same decision an engineering lead makes on a commissioning schedule. Lecture 6 is about the version of that decision where the evidence is incomplete, and Lecture 8 about the version where the cash is running out.

What this chapter is and is not

It is a record, assembled from public sources, of what the author of the frame has done. What a record of this kind cannot establish on its own is causation: no counterfactual is available, and timing, colleagues and capital matter in any career at this level. So read it as what it is — good reason to take the book seriously, and to read it closely — and then weigh each of its claims against the evidence the lectures set beside them — which is how you would read a senior colleague whose judgement you respect.

Chapter 3

The Case: The Northline Programme

Teaching case

This case is fictional. Northline Energy Systems, its people, its customers and its numbers are invented for discussion. The setting — battery energy storage for remote northern communities and mine sites — and the kinds of pressure in it are drawn from how such programmes are commonly described. Dates run from 2027 to 2034; rules, rates and prices are those in force in 2026, and all figures in the case are Canadian dollars. (The corporate figures in Chapter 2 are US dollars, as reported.)

This case runs underneath all nine lectures. It is deliberately longer than the case in any single lecture, and deliberately unresolved: nothing in this document says what Amara Osei should do at any point in it. That is not modesty about a fictional case; it is the pedagogy. A case with a stated answer teaches you the answer; a case without one makes you notice that you reached for an answer before you had named the constraint. The case is also compressed — eight years of decisions arranged so that each lecture has something real to act on — so what is meant to be typical is the *structure*, not the pace: a technical judgement with commercial consequences, made where authority and information sit with different people, under a contract nobody in the room negotiated, by someone whose own life runs on a slower clock than the programme. The purpose is to name the kinds of complexity you will have to navigate; each lecture then hands you one instrument for one part of it.

3.1 The company and the programme

Northline Energy Systems builds containerised battery energy storage systems and the microgrid controllers that run them. Its customers are remote: communities and mine sites off the provincial grid that burn diesel for electricity, at a delivered cost several times what grid power costs in the south. A Northline system pairs batteries and controls with existing diesel generators and, where present, solar; done well it cuts fuel burn, emissions and the number of flights or winter road runs needed to deliver fuel.

Exhibit 1 — Northline Energy Systems at a glance, January 2027

Founded	2014, in Sudbury, Ontario; 240 employees, of whom 95 are engineers
Products	250 kW–2 MW containerised battery systems; the *Northstar* microgrid controller; commissioning and 10-year service contracts
Revenue	$96 million in 2026, about 70% hardware and 30% service
Ownership	Founder-led; two venture rounds (2019, 2023); no public listing
The programme	**Northline 2**: 18 systems in three funded tranches — 12 for remote communities under a provincial decarbonisation programme, 6 for mining customers. Tranche 1 (Sites 1–6) runs 2027–2030; tranches 2 and 3 follow as funding is released
Contract shape	Provincial sites: firm fixed price, roughly $4.5 million a site, milestone payments, liquidated damages of $18,000 a day past the contract completion date, capped at 10% of site value — that is, about 25 days of delay before the cap is reached. Mining sites: commercial terms, faster payment, tighter confidentiality
Backlog concentration	The provincial programme is 62% of the Northline 2 backlog

3.2 The graduate

Amara Osei graduates in April 2027 with a B.A.Sc. in electrical engineering, a power and controls option, and a capstone project on state-of-charge estimation. She grew up in Sudbury. She has two job offers and one funded graduate place, and four weeks to decide (Exhibit 2).

Exhibit 2 — Amara's three options, April 2027

Option	Details
A. The utility	Protection and controls engineer at a provincial utility, Thunder Bay. $78,000, defined-benefit pension, a structured four-year development programme with rotations and a named supervising P.Eng. Work is standards-heavy and slow-moving; layoffs are rare
B. Northline	Controls engineer on Northline 2, Sudbury, with three to eight weeks a year on remote sites. $84,000 plus options over 0.04% of the company, vesting over four years. The Northline 2 engineering team is 11 across controls, power electronics and systems, drawn from the company's 95 engineers; the programme is the company's largest ever
C. The MASc	Funded master's in power electronics at her own university, $27,000 a year stipend for two years, with a supervisor who has industrial partners and a reputation for letting students finish

Exhibit 3 — Amara's card, written in fourth year

What matters to me: work that measurably cuts emissions; being near my family; learning something hard every year; being someone people trust with bad news.

Where I want to be by 30: leading a commissioning team; licensed; able to carry a mortgage on my own; running again; not living out of a suitcase.

What I am afraid of: being three years into something I do not respect, and not noticing.

3.3 What happens next

She takes one of the three. The case below follows the Northline path, because it is the one that exercises every lecture in the series; the instructor notes suggest how to run it with the utility and the graduate-school paths instead.

Exhibit 4 — The people

Ito Ferreira	Her manager, engineering manager for controls. On site three weeks in four during commissioning season; responsive by message, rarely in person
Dale Whitcombe	Principal engineer, at Northline since its first year, wrote the original *Northstar* fault logic. Sits on every design review
Rosalie Cardinal	Operations manager for the community-owned energy authority that hosts Sites 1 and 4; the customer's voice on the ground, and the person who must explain any delay locally
Gabriel Roy	Northline's programme manager: owns the schedule, the milestones and the liquidated damages
Hanne Skov	Chief executive and co-founder; raised both rounds; decides what the company promises
Tomas Lindqvist	A university friend at the utility, who took Option A

2027–2030: the first 1,000 days

Amara's first six weeks are a laptop, a desk and a repository with no README. Ito is on site. She is assigned to the *Northstar* controller's battery-management interface and told, in a two-line message, to "get familiar and start on the alarm rationalisation". Nobody tells her what good looks like at 90 days, and her formal review is eleven months away.

2028: the design review

She proposes a change to the fault logic: the existing propagation interlock latches on a single cell-voltage excursion, which she has traced to 14 trips across three sites that she assesses as nuisance trips, each costing a site visit. She brings the trip log and the test set she built it from. In the review, Dale objects that the logic has run safely for fourteen years, that her test set is small, and that "we are not re-litigating the interlock six weeks before a shipment". The change is not adopted. Two of her colleagues tell her afterwards that they had agreed with her and had not said so.

2029: the site that would not commission

Site 4 slips. The enclosure arrives late; the inverter supplier ships firmware that fails the grid-forming test; a subcontractor's electrician leaves mid-job. The site lead sends daily reports that, Amara notices, read differently from the test logs. Gabriel wants a date. Rosalie needs to tell the community whether the diesel order for freeze-up should be placed, and placing it costs $140,000 that the community's energy authority has budgeted against savings the system was supposed to deliver. Amara has the test logs and a view. She is 26, two years in, and not on the customer call.

Exhibit 5 — Site 4, 17 October 2029: two accounts of the same day

Daily site report (site lead to programme manager, 17:42, verbatim extract):

> *Grid-forming testing progressing. Inverter firmware behaving better today after supplier patch. Expect to close out remaining test items this week and be ready for witness test w/c 22 Oct. Electrical subcontractor short one person, covering internally. No change to commissioning date.*

Controller test log (automatic, same site, same day, extract):

```
11:04   GFM-07 islanded transfer    FAIL (freq. excursion 1.2 Hz; ride-through 180 ms)
13:22   GFM-07 islanded transfer    FAIL (freq. excursion 0.9 Hz)
15:51   GFM-07 islanded transfer    FAIL (freq. excursion 1.0 Hz)
16:30   GFM-11 black start          NOT RUN (prerequisite GFM-07 open)
16:31   open test items:  9 of 24   (unchanged since 08 Oct)
```

Neither document is addressed to Rosalie Cardinal, who has to decide about the diesel order. What each one leaves out, and whether either is wrong, is a question for the reader.

2029: the forty-hour question

Before shipment of Site 6, Amara finds that the cell supplier's thermal-runaway propagation report covers enclosure revision B; Northline now ships revision C, which changed the vent path and the cable entry. The supplier says the difference is immaterial and will confirm in writing "in a few weeks". Northline's own reduced test would take about forty hours and a spare rack the programme does not have on site. Shipping on time protects the milestone payment and avoids $18,000 a day. Holding the shipment costs money now and admits a gap in the evidence to a customer who has begun to ask harder questions.

2030–2031: the lead

Amara is made team lead for controls: six engineers, two of them new graduates, one of them Dale's former protégé. Her own best work — the estimator, the alarm logic — now belongs to other people, who will do it differently. She is asked to run hiring for two positions, to write performance reviews for the first time, and to keep delivering her own share of the programme's work.

2031–2032: the business

A mining customer defers two sites after a commodity price fall, and the provincial programme's third tranche is delayed pending a spending review. Northline's receivables stretch; the board discusses a bridge loan on terms that would reprice the options Amara holds. Hanne asks the engineering leads what could be cut without breaking the product: scope, features, the service model, or people. Everyone in the room is being asked to price things they cannot measure.

2033: the left turn

A larger firm offers Amara a senior controls role in Vancouver at a 28% raise and a title she would wait three years for at Northline. In the same month her older sister takes a job overseas, so that if Amara took the Vancouver role nobody would be near their mother's house in Sudbury. Northline's programme is up for renewal after a provincial election in which the decarbonisation programme is being debated by both parties. Amara has not taken more than four consecutive days off since 2029, has not run since 2031, and has a licence application she has not finished.

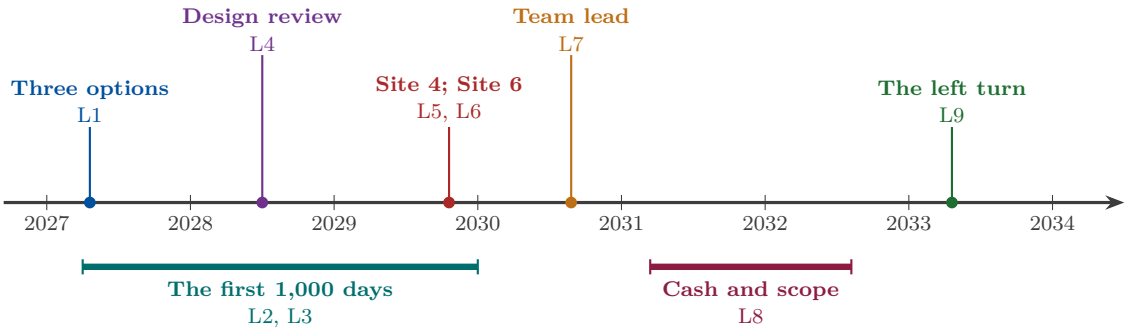


Figure 3.1: The Northline case, 2027–2034, with the lecture that equips you for each decision. Stems above the axis mark single decisions; bars below it mark episodes that run over time. The lectures are not a solution key: each supplies a method, a body of evidence and a set of questions, and the decision stays with the engineer.

3.4 Six kinds of complexity

Students often read a case like this as one problem with a hidden right answer. It is at least six kinds of difficulty braided together, with different logics, different evidence and different failure modes; naming them is the first skill this series teaches.

Table 3.1, after the three properties below, sets out the six. Three properties of that list matter more than the list itself.

1. **They are coupled.** The technical decision at Site 6 is also a commercial decision, a professional one and a community one. An answer that optimises one of them will still have to be defended from the other five directions.

2. **They resolve on different time constants.** A schedule slips in days, a reputation moves in years, a licence takes four, and a body or a friendship degrades on a scale you do not notice until it fails. A decision that looks free this week is often paid for on a slower loop.

3. **Only some of them are yours to decide.** Amara does not set the contract, the commodity price that defers two sites, or the outcome of an election. Knowing which variables you actually control — and which you can only prepare for — is most of the skill.

Table 3.1: Six kinds of complexity in the Northline case, and where each one appears

Kind	What makes it hard	Where it shows in the case
Technical	The evidence is incomplete and the test that would complete it costs time you are told you do not have	Revision B versus revision C; 14 trips, and a disagreement about whether the test set is large enough
Commercial	Money arrives on milestones, leaves continuously, and the contract prices lateness but not quality	$18,000 a day; 62% of backlog in one programme; deferred sites
Organisational	Authority, information and responsibility sit with different people, and none of them is in the room at the same time	A manager on site three weeks in four; a principal engineer who owns the legacy design; site reports that differ from the logs
Professional	Duties that follow the individual, not the employer: competence, honesty, public safety, licensure	The interlock argument; the shipment decision; an unfinished licence application
Community	Decisions land on people who did not choose them and cannot exit	A $140,000 diesel order; a community energy authority explaining a delay locally
Personal	Finite time, health, relationships, money and geography, all of which change slowly and then suddenly	No break longer than four days since 2029; a family house; a 28% raise across the country

Discussion questions

Before you read on, write a short answer to each. There are no marks and no right answers; keep what you write, because Chapter 5 and the outro — the closing document of the series, which returns to this case after all nine lectures — both come back to it.

1. Which of the six complexities would you personally find hardest, and why that one?
2. At which moment in Figure 3.1 does Amara have the most freedom to act? At which does she have the least?
3. Name one decision in the case whose first-order effect and third-order effect point in opposite directions.
4. What would you need to know, that the case does not tell you, before you would be willing to decide the Site 6 question?

Chapter 4

The Engineer's Roadmap

Zelnick's book is conversational and sequential: do this, then this. Engineers do not think in sequences; they think in systems with feedback. So the series carries one framework from beginning to end, and it is a framework you already know how to analyse — a closed-loop control system with an outer supervisory loop and a safety interlock (Figure 4.1).

The analogy is not decoration. It is chosen because it makes four things sayable that plain career advice leaves vague: that you cannot control what you do not measure; that measurement takes time and arrives late; that a loop with no reference amplifies whatever noise is loudest; and that some constraints are not trade-offs but interlocks.

It also buys a vocabulary that survives disagreement. "You should have pushed harder" and "you pushed too hard" are not arguments; they are opinions about gain. "Your loop has no reference" and "your sampling rate is annual" are statements someone can agree or disagree with, and then check. That is the practical reason to carry one diagram through nine lectures rather than a list of maxims: it turns career advice into claims with a shape, and claims with a shape can be tested against the case in Chapter 3 and against your own year.

Figure 4.1 is printed on a landscape page of its own, after Table 4.1, so that every block and every signal is legible at reading size. Spend a minute with it before going on. The rest of this chapter names the blocks one at a time, sets out eight properties of the loop worth knowing before Lecture 1, and ends with a table of what a failure in each block looks like from outside.

4.1 The blocks

Each block is something you can improve on its own, and each is the subject of at least one lecture. Table 4.1 states what each one is in a career, which lecture develops it, and where it appears in the Northline case.

Table 4.1: The blocks of the Engineer's Roadmap: what each one is in a career, the lecture that develops it, and where it appears in the Northline case

Block	What it is in a career	Lecture	In the Northline case
Setpoint	The written list of values and goals that says what you are aiming at, and therefore what counts as an error	L1, L2	Amara's card: emissions, family, learning, trust
Comparator	The habit of comparing where you are with where you said you wanted to be	L1, L3	Eleven months to a formal review; nothing at 90 days
Controller	What you actually do with the gap: priorities, what you say yes and no to, what you delegate	L2, L7, L8	Alarm rationalisation versus the interlock argument; later, what to cut
Plant	The part of the world your effort acts on: your work, your team, your standing	L3, L4, L5, L7	The controller firmware, six engineers, a customer's trust
Sensor (fast loop)	Short-cycle measurement: tests, numbers, weekly review, people telling you plainly	L3, L4	Test logs that disagree with the daily report
Dead time	The lag between doing the work and seeing what it did to your standing	L3, L4	The 2028 design review, and when its effects on her standing become visible
Observer	Estimating what you cannot measure directly — your reputation, your standing, how the room actually heard you	L4, L5	Two colleagues who agreed privately and not in the room
Setpoint governor (slow loop)	The annual, deliberate revision of the setpoint itself	L1, L9	2033: a raise, a family house, an election
Feedforward	Acting on a disturbance you can see coming, before the error appears	L9	Savings, a current résumé, a network
Disturbances	What acts on you regardless: markets, politics, technology, luck	L8, L9	A commodity price, a spending review, a supplier's firmware
Interlock	Constraints that stop the process rather than trading off against it	L6	The revision B report and the shipment date
Integrity test	The question that opens the interlock: would you defend this decision, in writing, to someone it harmed?	L6	Whether the Site 6 shipment is an integrity question at all
Watchdog	Health, relationships and money: slow variables that halt everything when they fail	L9	No break longer than four days since 2029; no running since 2031

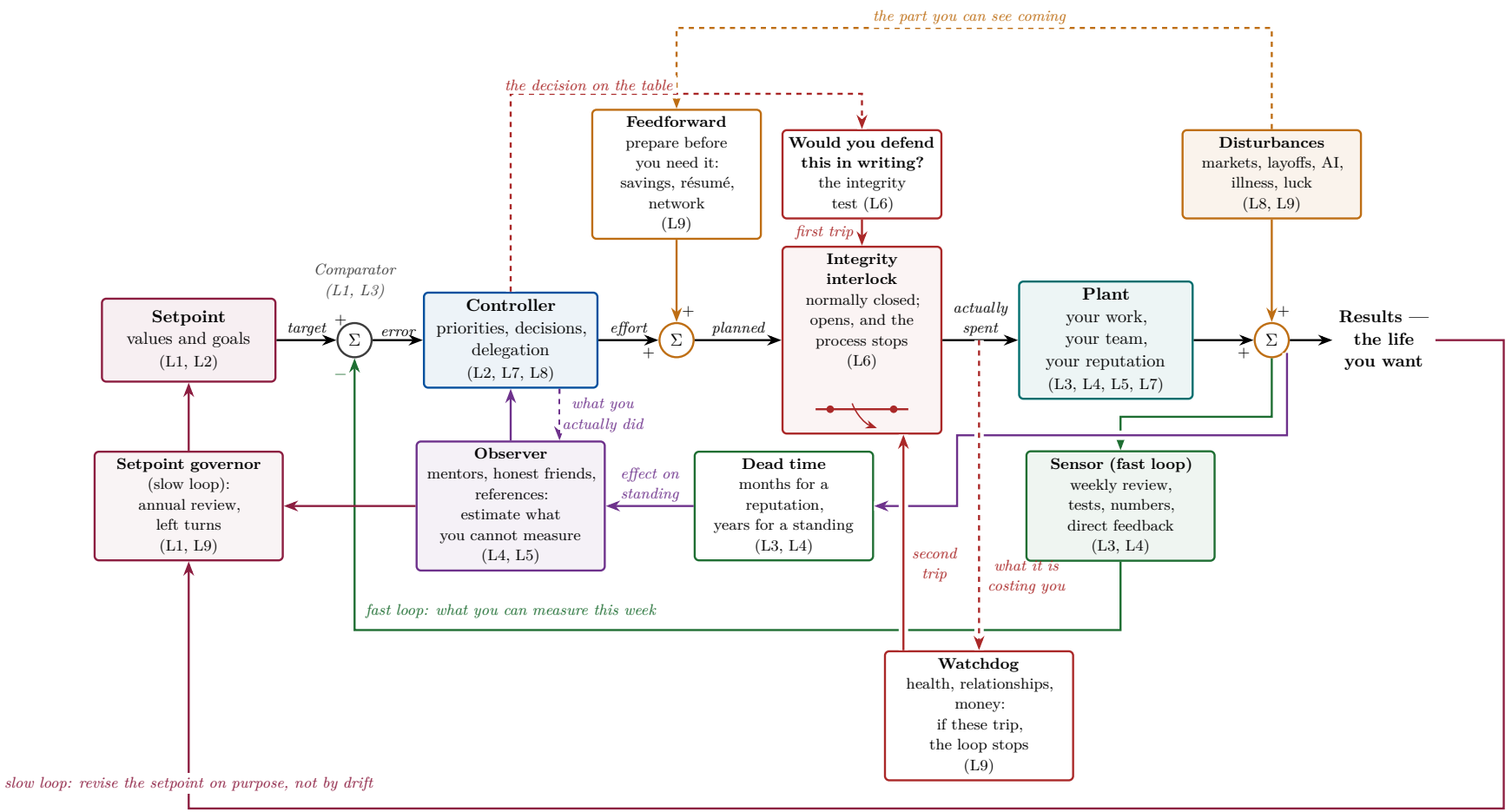


Figure 4.1: The Engineer's Roadmap. A career as a closed-loop system: a fast inner loop from the sensor straight to the comparator; a slow outer loop in which what you do reaches your standing only after dead time, is estimated by the observer, and revises the setpoint through the governor; feedforward against disturbances you can see coming; and an integrity interlock in series with everything that reaches the plant, feedforward included. **L1–L9** mark the lecture that develops each block. Note what the interlock is *not*: it is not a weighting inside the controller. It sits in the forward path, it is normally closed, and either of its two trip inputs opens it and stops the process. The arrangement is the series' organising claim — the blocks are separable, each can be improved on its own, and a failure in one of them has a characteristic signature in the output (Table 4.2).

4.2 Eight properties worth knowing before Lecture 1

1. **No setpoint, no control.** A loop with no reference does not sit still; it amplifies whatever noise is loudest. An engineer with no written goals works on whatever arrived last by email. Zelnick's first instruction is to get the whole list down in writing (pp. 26–28), and the evidence on goal setting is unusually good for this kind of claim: specific, difficult goals produce higher performance than vague encouragement across hundreds of studies (Locke and Latham, 2002), and a single structured goal-setting exercise improved academic performance in 85 struggling undergraduates over the following months (Morisano et al., 2010). A larger randomised field experiment with about 1,400 first-year undergraduates found no effect on grades, credits or persistence, with enough precision to have detected a small one (Dobronyi et al., 2019). That is the honest state of the evidence: writing goals down is cheap and well-supported as a practice, and it is not a guarantee of outcome.

2. **The sampling rate sets the correction rate.** Zelnick reviews his lists "at least weekly" (p. 28). A loop sampled once a year, at performance-review time, cannot correct drift; it can only discover it.

3. **Dead time is the hard part.** Effort acts on your reputation with a lag of months and on your standing in a profession with a lag of years. Control engineers know what dead time does to a loop: it makes aggressive correction unstable. When a career decision feels urgent, it is worth asking whether the urgency is real or whether the gain is set too high for the delay.

4. **Saturation is real.** Time, attention, health and cash are hard limits. A controller that ignores its actuator limits produces a plan that cannot be executed, and then blames the operator.

5. **Integrator windup is the quiet failure.** Unspoken frustration accumulates. If nothing resets it — a conversation, a decision, a departure — the output eventually swings hard, and the swing is blamed on the last small thing rather than the accumulation.

6. **You need an observer, not just a sensor.** The variables that matter most — whether people trust you, whether you are thought of for the interesting work — are not directly measurable. They are estimated from indirect evidence by people who will tell you the truth. Choosing those people is an engineering decision.

7. **Feedforward beats feedback for disturbances you can see coming.** You cannot stop a market or a spending review, but you can hold savings, keep a résumé current and keep a network alive *before* the error appears. Lecture 9 makes this concrete.

8. **Interlocks are not gains.** An interlock is not a strongly weighted term in an objective function; it is a condition that stops the process. Once integrity is modelled as a weighting, there is always a price at which it loses, and Lecture 6 is about the moment that price is offered.

Engineering translation

Using the roadmap on an actual decision. Take any decision in the Northline case, or in your own life, and ask the same six questions in order. *What is the setpoint* — which written value or goal does this serve? *What is the error* — how far is the current state from it, measured how? *Which block is failing* — is this a setpoint problem (you do not know what you want), a sensor problem (you cannot see the state), a controller problem (you know and can see, but are not acting), or a plant problem (you are acting and it is not working)? *What is the disturbance, and is it forecastable? What are the limits* — time, money, health? And finally, *is an interlock involved* — is any option in the set one you would not defend in writing? The framework's claim about that last question is structural, not moral: an interlock removes options from the set rather than discounting them, so whatever remains is decided without it. Whether any particular option in the Northline case is on the wrong side of that line is exactly what the lectures ask you to argue.

Where the analogy stops

A career is not a linear time-invariant system. The plant changes while you drive it, the disturbances are not stationary, other people are optimising against their own setpoints, and you cannot run the experiment twice. The framework is a way to organise attention and to make disagreements precise — "we disagree about the setpoint" is a more useful sentence than "we disagree" — not a model you should trust to three significant figures.

4.3 What each failure looks like from outside

A failure in one block has a characteristic signature. Naming it is what stops you treating every career problem as the same problem — which is usually "work harder". Disturbances are inputs rather than blocks, so they have no failure of their own; the integrity test fails in the same way as the interlock it opens.

Table 4.2: What a failure in each block looks like from outside, and the first thing to check. These are patterns to test, not diagnoses

Failing block	What you see	First thing to check
Setpoint	Busy, competent, and unable to say why this job rather than another; every offer looks tempting	Is there a written list, dated, that somebody could hold you to?
Comparator	The list exists but nothing is compared to it; surprise at review time	When did you last put the current state next to the target?
Sensor	You find out late, from someone else, and it is worse than you thought	What is measured weekly, and who tells you plainly?
Observer	The numbers look fine and the room does not; you are not asked for the interesting work	Who would tell you if your standing had slipped?
Controller	You can see the gap and describe it precisely, and nothing changes	What did you stop doing this quarter?
Plant	You act, repeatedly, and the output does not move	Is the effort landing where the leverage is?
Dead time	You correct hard, then correct hard the other way; nothing settles	How long does this actually take to show up, and is your gain set for that?
Feedforward	Every disturbance arrives as an emergency	What is the next foreseeable one, and what is already in place for it?
Interlock	The decision is being argued as a trade-off at all	Would you defend this in writing, to someone who was harmed by it?
Setpoint governor	Nothing has gone wrong and nothing is what you meant; the list has not changed in four years	When did you last revise the setpoint on purpose?
Watchdog	Everything above is working, and you are not	When did you last take a week off, or look at the money?

Chapter 5

How the Nine Lectures Meet the Case

Each lecture leads with one to three blocks of the roadmap and one or two kinds of complexity (Table 5.1; Table 4.1 lists every lecture that touches each block), develops them with Zelnick, Morse, Schell & Babcock and the research, and tests them on a case of its own. This chapter says which is which, so that you can read the series as a single argument rather than nine essays.

Table 5.1: How the nine lectures map onto the roadmap, the kinds of complexity and the case

#	Lecture	Lead block(s)	Complexity	Moment in the Northline case
1	Knowing What You Want	Setpoint	Personal	The three options, April 2027
2	Ambition, Priorities and the Long Game	Setpoint, controller	Personal, organisational	Choosing what to work on in year one
3	The First 1,000 Days	Plant, fast sensor	Organisational	No definition of "good" at 90 days
4	Listen, Sell, Speak	Sensor, observer	Organisational, technical	The design review and what happened to the proposal
5	People, Politics and Resilience	Plant, observer	Organisational, community	Site 4: reports that disagree with the logs
6	Integrity, Truth and Mistakes	Interlock	Professional, technical	Site 6: revision B evidence, revision C hardware
7	From Engineer to Leader	Controller, plant	Organisational	Six engineers, two new graduates, one of them formerly Dale's protégé
8	The Business Behind the Engineering	Controller, disturbances	Commercial	Deferred sites, stretched receivables, what to cut
9	Renewal	Governor, feedforward, watchdog	Personal, commercial	2033: a raise, a family house, an election

5.1 Lecture 1 — Knowing What You Want

Supplies. Zelnick's opening instruction — write down your values, then your goals, and review them — together with the evidence on why written, specific goals outperform intentions (Locke and Latham, 2002; Morisano et al., 2010), and Morse, Schell & Babcock's point that "you need to define what success in a career means to you, because this in turn influences what actions are appropriate" (Morse et al., 2020, p. 365).

Meets in the case. April 2027. Three options that differ in salary, pension, location, pace, ownership and time to a licence (Exhibit 2), and cannot be ranked without a setpoint. The card

in Exhibit 3 is a draft setpoint; the lecture makes it usable.

Question. Score each of the three options against the card in Exhibit 3, one line per value. Where the card is silent, say what it would need to say for the ranking to change.

5.2 Lecture 2 — Ambition, Priorities and the Long Game

Supplies. Ambition as a direction rather than a volume knob; prioritisation by impact against difficulty; the discipline of deciding what you will not do; Morse, Schell & Babcock on time management; and the evidence, developed in that lecture, on how sustained effort compares with intensity.

Meets in the case. Year one at Northline. Alarm rationalisation is what she was asked to do; the interlock behaviour is what she found. Both are open, and the quarter holds one of them.

Question. What should Amara's first year optimise for — visible delivery, technical depth or standing with the people who allocate work — and what does each choice cost the other two?

5.3 Lecture 3 — The First 1,000 Days

Supplies. How to start: establishing what "good" looks like in 90 days when nobody says it, reading the culture, the relationship with a manager who is not there, early wins, and Morse, Schell & Babcock on getting off to the right start.

Meets in the case. Six weeks with a repository and no README; a manager on site three weeks in four; a formal review eleven months away. In the vocabulary of Chapter 4, the first question is which blocks are actually running — and, for any that are not, what supplying them would cost and who would have to agree.

Question. In week two, should Amara ask Ito for anything — and if so, what, in how many lines, and at what cost to a manager who is on site three weeks in four? If not, what would she do instead?

5.4 Lecture 4 — Listen, Sell, Speak

Supplies. Listening as an instrument; the difference between being right and being adopted; structuring a technical argument for the person who has to say yes; Morse, Schell & Babcock's communication model; the research on what actually persuades in technical settings.

Meets in the case. The 2028 design review. A proposal was not adopted, its author believed the data supported it, the principal engineer did not, and two colleagues said afterwards that they had agreed and had not said so. Whatever one concludes about the engineering, the gap between the private and the public response is observer information.

Question. Write Dale's strongest objection and Amara's strongest reply, each in three sentences. What would have to be true for each of them to be right — and what could either of them have done before the meeting to find out?

5.5 Lecture 5 — People, Politics and Resilience

Supplies. Working with people whose incentives differ from yours; what to do when reported status and measured status diverge; how to raise a problem without making an enemy; resilience as a practice rather than a trait.

Meets in the case. Site 4. Daily reports that read differently from the test logs, a programme manager who needs a date, and a customer who must place a $140,000 diesel order on the strength of whatever she is told.

Question. Amara has the test logs and is not on the customer call. List her options, in order of escalation, and name the first-order and second-order effects of each.

5.6 Lecture 6 — Integrity, Truth and Mistakes

Supplies. Integrity as an interlock, not a preference; reporting bad news early; owning mistakes in a way that survives contact with a schedule; the professional obligations that follow the individual engineer regardless of employer.

Meets in the case. Site 6 and the revision B report. Forty hours of test and a spare rack against $18,000 a day and a milestone payment, with a supplier promising written confirmation "in a few weeks".

Question. Set out the options open to Amara on the morning of the shipment, including the ones nobody in the case proposes. For each, say what it costs, who carries that cost, and what would have to be true about the revision B report for it to be the one you would defend.

5.7 Lecture 7 — From Engineer to Leader

Supplies. The transition that costs most engineers their identity: letting go of the work that made you good; delegation as a control problem; hiring; giving feedback; Morse, Schell & Babcock on the move from engineer to manager.

Meets in the case. 2030. Six engineers, two new graduates, one of them formerly Dale's protégé, and her own estimator now maintained by somebody else.

Question. Which task should Amara delegate first, knowing it may be done less well this quarter — and how will she know in six months whether that was right?

5.8 Lecture 8 — The Business Behind the Engineering

Supplies. How the company actually makes and holds money: revenue against cash, milestones, receivables, customer concentration, unit economics, and why engineering decisions are priced in cash-flow terms by everyone above you.

Meets in the case. 2031–32. Two deferred sites, a delayed tranche, 62% of backlog in one programme, a bridge loan that would reprice her options, and a question about what to cut.

Question. Rank scope, features, service model and people as things to cut, using the cash-flow consequences rather than the engineering ones. Where do the two rankings disagree?

5.9 Lecture 9 — Renewal

Supplies. Deliberate changes of direction and how to test them cheaply; what to do before, during and after a job ends, including the Canadian rules; and the rest of a life — people, health, gratitude — treated as a system that halts the others when it fails.

Meets in the case. 2033. A 28% raise on the other side of the country, a family house with nobody near it, a programme facing an election, an unfinished licence application, and a body that has not run since 2031.

Question. Which of these is a setpoint change and which is a disturbance — and what is the cheapest experiment that would tell Amara the difference before she has to commit?

5.10 How to use this chapter while you read

Three habits make the difference between reading nine lectures and carrying one framework through them. First, before each lecture, re-read the three lines above for it and write down your own answer to the question — badly, in two minutes. You will be wrong in a specific way, and specific wrongness is what a lecture can correct; a blank page cannot be corrected. Second, after each lecture, go back to the Northline narrative in Chapter 3 and mark the sentences that have changed meaning. There will usually be two or three, and they are rarely the ones the lecture was nominally about. Third, keep a single running list of the decisions you would now make differently in your own life, not Amara's. That list is the actual output of the series; the outro asks you to compare it against the setpoint you write this week.

A warning about the mapping in Table 5.1. It gives each lecture its lead blocks because that is how the material is taught, not because careers arrive sorted. Every moment in the case involves most of the blocks at once: the Site 6 decision can be read as an interlock question, and as a sensor question (what does the evidence actually cover?), a commercial question ($18,000 a day), an organisational question (who decides) and a personal one (what it costs to be the person who says it). The lectures separate them so you can practise each; the outro puts them back together.

The case is not a worked example

None of these questions has an answer key. The outro revisits the whole case after all nine lectures and asks you to decide — with the framework, the evidence and the vocabulary you will have by then — and then to say what you would expect to happen next, and next after that.

Chapter 6

Before You Begin

One piece of work comes before Lecture 1, and everything else in the series attaches to it. It is the setpoint: the written list of what you value and what you are aiming at. Lecture 1 develops it, Lectures 2–8 test it against the world, and Lecture 9 asks you to revise it on purpose.

Capstone move

Before the first lecture, write two lists on one page. *Values*: what you want to be true about how you work and live — not achievements, but standards. *Goals*: what you want to be true by a date, each one specific enough that someone else could tell whether it happened. Ten minutes is enough for the first draft. Keep the page; several of the lectures ask you to revise it.

Assignment — Personal Setpoint, first draft (pre-work for Lecture 1)

Task.

1. Write four to eight *values*: standards you want to hold, in your own words.
2. Write four to eight *goals* with dates, each one written so that a stranger could tell whether you had reached it.
3. For each goal, write one sentence saying how you would measure progress in the next three months — that is, what your fast loop would sense.
4. Name one disturbance you can already see coming in the next two years, and one thing you could do now that would reduce its effect (feedforward).

Deliverable and due date. One page (PDF), brought to Lecture 1. It is personal: you decide what to share, and nothing in it has to be disclosed to earn full marks.

Marking (5 marks).

- *Values* (1): standards rather than achievements (1); a list of achievements (0.5); missing (0).
- *Goals* (2): dated and checkable by a third party (2); dated but vague (1); undated (0.5); missing (0).
- *Measurement* (1): each goal has a three-month indicator (1); some do (0.5); none (0).
- *Feedforward* (1): a named disturbance and a concrete present action (1); a named disturbance only (0.5); missing (0).

Discussion questions

1. Which block of Figure 4.1 do you think is weakest in your own life right now, and what evidence tells you that?
2. Zelnick reviews his lists weekly. What sampling rate can you actually sustain, and what happens to the loop at that rate?
3. The case names six kinds of complexity. Which two are most tightly coupled in the Northline programme, and what would decouple them?
4. Pick any decision in Figure 3.1. State its first-order effect (this month), its second-order effect (this year) and its third-order effect (five years out). Which of the three is easiest to be confident about, and which matters most?

The one-sentence version of this document. A career is a controlled process: decide the setpoint and write it down, measure often enough to correct, estimate what you cannot measure by keeping honest people close, prepare for the disturbances you can see coming, respect the limits of time and health — and treat integrity as an interlock that stops the process rather than a term you are free to trade away.

What comes next

Lecture 1 starts with the setpoint. Work through the nine lectures in order if you can; each ends with an assignment, and the assignments accumulate into a portfolio you will actually use: a setpoint, a priority list with something on it you have decided not to do, a 90-day plan, a technical argument, an escalation plan, an integrity note, a delegation plan, a one-page read of your employer's business, and a renewal plan — one from each of the nine. The outro returns to Amara Osei in 2034 and asks what you would have done, and what you think would have happened next.

Glossary

Alarm rationalisation Reviewing every alarm a system can raise and removing, merging or re-prioritising those that do not require an operator to act.

Backlog concentration The share of contracted future work that comes from a single customer or programme.

BESS Battery energy storage system: batteries, power electronics and controls packaged to store and return electrical energy.

Black start Bringing a system up from no power at all, without support from a grid.

Commissioning The process of proving on site that an installed system performs as designed, ending in a documented handover.

Comparator The element that subtracts what you have measured from what you said you wanted; its output is the error.

Controller In this series, what you do with the gap between where you are and where you said you wanted to be: priorities, decisions, delegation.

Dead time The delay between an action and its visible effect; in a career, the months or years before work changes a reputation.

Disturbance An input you do not control that moves the output: a market, a layoff, a spending review, luck.

Feedforward Acting on a predicted disturbance before the error appears, rather than correcting afterwards.

GFM Grid-forming; the tag used on the controller's test identifiers.

Grid-forming An inverter control mode that establishes voltage and frequency itself rather than following an existing grid; what a microgrid needs when the diesels are off.

Interlock A condition that stops a process rather than trading off against other objectives; here, integrity.

Liquidated damages A contractually fixed amount payable for each day of delay, agreed in advance instead of proving actual loss.

Microgrid A local network of generation, storage and loads that can run independently of a larger grid.

Milestone payment Payment released when a defined stage of work is accepted, rather than at a steady rate.

Net bookings The value of products and services sold in a period, whether or not the revenue is recognised then; the headline measure in this industry.

Nuisance trip A protective trip on a condition that was not actually unsafe; each one costs availability and, in a remote system, a site visit.

Observer An estimate of states you cannot measure directly, built from indirect evidence; here, the people who tell you the truth about your standing.

Personal Setpoint The written list of values and goals used throughout this series as the reference the rest of the loop tracks.

Plant The part of the world your effort acts on: your work, your team, your reputation.

Receivables Money a customer has been invoiced for and has not yet paid; work already done that is not yet cash.

Ride-through The ability to stay connected and stable through a short disturbance rather than tripping off.

Sampling rate How often you measure; it bounds how fast a loop can correct drift.

Saturation A hard limit on an actuator; here, time, attention, money and health.

Sensor Short-cycle measurement of the things you can measure directly: tests, numbers, a weekly review, people telling you plainly.

Setpoint The reference the loop is driven towards; here, the written list of values and goals.

Setpoint governor The slow outer loop that revises the setpoint itself, deliberately rather than by drift.

Thermal runaway propagation The spread of an uncontrolled temperature rise from one battery cell to its neighbours; the failure mode an enclosure design is tested against.

Tranche One scheduled instalment of a larger funding commitment.

Watchdog A monitor that halts the system when something essential fails; here, health, relationships and money.

Windup The accumulation of an uncorrected error until the eventual response is disproportionate.

Witness test A test run in front of the customer, whose result is what the contract accepts.

Instructor Notes

Purpose and timing

This document is the opening session of the series and the reference students return to. A 50-minute session covers it on the timings in the plan below. Materials: printed copies of Exhibits 1–5 and Figure 4.1, one page each.

Session plan

The plan below is one way to spend the 50 minutes.

A 50-minute session plan for the introduction

Minutes	Segment	Instructor moves
0–10	Why this book	Read the five reasons; then read the myth check. Ask the room which of the five they find least convincing.
10–30	The case	Read Exhibits 1–5 aloud or in pairs. Vote on which of the three options students would take, then ask the room to name the complexity they are most confident they could handle, and the one they are least.
30–42	The roadmap	Draw Figure 4.1 live, block by block, in this order: setpoint, plant, sensor, controller, disturbance, interlock. Ask which block each Northline moment belongs to.
42–47	The map to the lectures	Put Table 5.1 on the screen and walk the nine rows in 90 seconds, then ask each student to name the one lecture they expect to need first, and why. Chapter 5 is the reading that follows this segment.
47–50	Close	Set the pre-work. Ask each student to write one value and one goal before they leave the room.

Running the case on a different path

The case follows Option B because it exercises every lecture. Two variants work well as parallel streams for different tables:

- **Option A (the utility).** The same blocks appear, but the disturbances are slower and the interlock moments are formalised by codes and protection standards. A question to put to the table: what does a structured development programme give, and what might it cost in breadth?
- **Option C (the MASc).** Two years of optionality bought with two years of income and two years of industrial experience. The setpoint question is sharper, and Lecture 8 lands differently: a graduate student's employer is a grant.

Talking points for the discussion questions

These notes are for you, not for the students. The student-facing chapters deliberately reach no verdict on the case; these are the lines of argument worth drawing out if the room stalls, not answers to be read out.

Chapter 3

Q1: rooms usually converge on "organisational" or "personal" rather than "technical"; the useful follow-up is to ask the students who said "technical" what makes it hardest for them, because they are often describing a different problem. Q2: most students pick April 2027 for the most freedom and Site 6 for the least. Put the counter-question back to them: at Site 6 the options are constrained by a contract, a supplier and a shipment date — so when was that constraint actually set, in 2029 or in 2027, when the programme's terms were agreed? Q3: any answer that names a short-term gain paid for by a slow variable, for example a deadline met by skipping the weekly review for a quarter. Q4: good answers ask for the supplier's test protocol, the difference between revisions, the failure mode the test addresses, and who else has already accepted the same gap.

Chapter 6

Q1: "sensor" is the commonest answer, and worth testing by asking what the student measured last week. Q2: most students who try a daily loop abandon it; a weekly one tends to survive. Ask what would have to change for a daily loop to be worth its cost. Q3: technical and commercial are coupled through the schedule; decoupling means buying slack with money or scope. Q4: use this to introduce the idea that confidence and importance are inversely related as the horizon lengthens.

Marking guidance

The pre-work is worth 5 marks and is graded on form, not on which values or goals a student chooses: whether values are standards rather than achievements, whether goals are dated and checkable, and whether each has an indicator. Do not require students to disclose personal material, and say so before they write. The one failure mode worth correcting early is a list of achievements masquerading as values ("get a good job" is a goal; "I tell people the truth about schedules" is a value).

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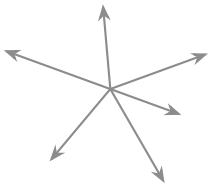
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Lecture 1

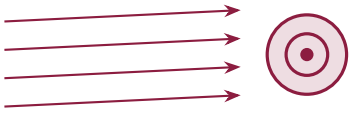
Knowing What You Want

Defining success before you chase it

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	Three Offers and a List (mechatronics)
Year:	2026



effort without a setpoint



effort aimed at what you want

Puranjan Gaur

Lead Technologist, School of Electrical Engineering and Computer Science

University of Ottawa

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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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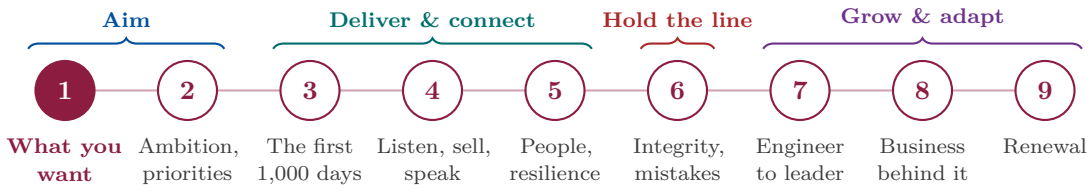
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Chapter 1

About This Lecture



This is the first of nine short lectures on what it takes to succeed — and to be satisfied — as a practising engineer. It starts where every control engineer starts: with the *setpoint*. Before you can decide how hard to work, which job to take or which skills to build, you have to know what you are aiming at.

Learning objectives

By the end of this lecture you will be able to:

- **Explain** why "knowing what you want" *aligns* talent, effort and education so that they add up, and where the research agrees and disagrees.
- **Distinguish** objective markers of career success (pay, title) from subjective success, and recognise the "If-I-just-get" trap.
- **Write** a values list and a goals list that are honest, specific and free of unresolved conflicts — and review them like an engineering specification.
- **Locate** your career "sweet spot" at the intersection of talent, passion and opportunity, and test it against your values.
- **Apply** all of this to a real decision: the offer, the graduate program or the role you choose after your capstone.
- **Produce** your *Personal Setpoint*: a short document, built across the three chapter assignments, that the rest of the series uses.

1.1 Two books, one argument

Strauss Zelnick's *Success: A Concise Guide to Having the Life You Want* (Zelnick, 2015) supplies the argument. Zelnick was president of Twentieth Century Fox at thirty-two, later chief executive of BMG Entertainment, co-founded the investment firm ZMC, and is today chairman and chief executive of Take-Two Interactive. For decades he has advised and mentored people starting their careers, and the book distils that advice. Its thesis is short: the attribute most common among highly successful people is that they **know what they want**.

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020)

supplies the engineering context: how careers in engineering are structured, which career fields a degree opens, and how professionals define success for themselves.

Peer-reviewed research tests both. Where it supports Zelnick you will see the study; where it complicates or corrects him, you will see that too. You are meant to argue with this material, not memorise it.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Personal Setpoint

Read the case study (Chapter 2, 15 minutes) first and write down what *you* would advise before reading anything else. Then read Chapters 3 (20 minutes), 4 (20 minutes) and 5 (20 minutes) in order, then Chapter 6 (10 minutes) — about 85 minutes in all. (The 80-minute class session described in the Instructor Notes is separate from this reading time.)

The three chapter assignments build one document, your **Personal Setpoint**: Part 1 (a one-page success definition, due at the end of week 1), Part 2 (values and goals with a change log, due in week 2, because it needs five days of iteration) and Part 3 (your sweet spot, due in week 3), bound together with a half-page summary. Lecture 2 turns it into priorities and a plan.

Chapter 2

Case Study: Three Offers and a List

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what final-year engineering students describe.

2.1 Sunday 1 November 2026, 10:40 p.m.

Priya Raman, a fourth-year mechatronics student graduating in April 2027, had three browser tabs open and a blank document titled "What I want." She had been staring at the document for forty minutes.

The first tab was an offer from **Northfield Automotive Systems**, the Tier-1 supplier in Kanata (Ottawa), where she had completed two co-op terms. The role — embedded validation engineer on a brake-by-wire controller — came with a good salary, a pension, a two-year rotation program, a manager she liked and a team that had asked for her by name. The offer expired in twelve days.

The second tab was an email from **Terrasense**, a nine-person climate-technology start-up in Guelph, five hours' drive from Ottawa, that flew multispectral drones over farmland and sold crop-stress maps to growers. The founder had watched Priya demonstrate her capstone rover at a pitch night and wanted her as the company's first mechatronics hire: a lower salary, a small equity grant, "real ownership from day one", and eighteen months of cash in the bank.

The third tab was a funded, conditional **MASc offer** — to start the following September — from her capstone supervisor's laboratory in Ottawa, in robotic perception for environmental monitoring — the subject she found most absorbing. It also meant two more years on a student stipend while her friends began earning, and Priya still owed $22,000 in student loans. Her parents, both near retirement, had said more than once that they were counting on her to help them.

Exhibit 1 — Priya's comparison, as she first wrote it

	Northfield (Tier-1)	Terrasense (start-up)	MASc (lab)
Location	Ottawa (Kanata)	Guelph	Ottawa
Year-1 pay	$84,000	$68,000 + 0.25% equity, vesting over four years (no market for the shares; value unknown)	$27,000 stipend
Cash flow	Loans repaid in about two years	Loans repaid in about three years	Stipend covers rent and food; loans deferred, not repaid

Typical hours	40–45 a week; weekends free	50–60 a week; "crunch" before field season	Flexible; deadline-driven
Learning	Structured, steady	Steep, unstructured	Deep, narrow
Mentoring	Strong manager, formal program	Founder (very busy)	Supervisor + lab
Risk	Low	High (18 months of cash)	Low
Opportunity cost	Equity upside and research depth deferred	Lower pay now; equity may be worth nothing	About two years of salary forgone
Path to P.Eng.	Clear (P.Eng. supervisors on staff)	Unclear (none on staff)	Delayed; some experience credit may count (check PEO's current rules)
"Feels like"	Safe	Exciting	Interesting

2.2 Everyone knows what Priya should want

Over the previous week Priya had asked for advice, and received plenty of it.

Exhibit 2 — Advice received, week of 26 October

Mother, a hospital pharmacist for 25 years (phone): "Northfield. A pension, a real company. We did not pay for five years of engineering so you could work in a garage."

Roommate, software engineer who joined a start-up in May (text): "start-ups are where you actually learn. big companies = 2 yrs of writing test cases"

Capstone supervisor, who left industry for a PhD (office hours): "You are obviously research material. The MASc would open doors that are hard to open later."

Co-op manager at Northfield, 18 years with the company (email): "We'd love to have you back. Most of our leads started exactly where you would."

Terrasense founder (LinkedIn message): "Honestly the equity could be life-changing. Nobody remembers who took the safe job."

Each piece of advice was sincere, and each was confident. Priya noticed something about the advisers themselves that she could not yet put into words.

2.3 The first draft of "What I want"

At 11:20 p.m. Priya typed the first things that came to mind.

Exhibit 3 — Priya's first-draft lists

Values ("who I am")

1. Close to my family in Ottawa
2. Work that helps the environment
3. Financial security (repay loans; help parents retire)
4. Always learning something hard
5. Being respected as an engineer
6. Weekends free for climbing

Goals ("what I want")

1. Be successful
2. Earn $150k by 30
3. Lead a robotics product someday
4. Get my P.Eng.
5. Maybe start a company
6. Do something that matters

She read the lists back and felt worse. "Be successful" was not a goal she could act on. "Earn $150k by 30" had come from a Reddit thread. Guelph was not Ottawa. And she had no idea how to weigh "work that helps the environment" against "financial security".

2.4 What the capstone had already shown her

Priya's capstone team was building an autonomous greenhouse-monitoring rover. Looking for evidence rather than opinions, she opened the personal time log she had kept since term began, alongside the team's task tracker.

Exhibit 4 — Priya's time log, September–October

Activity	Hours	Note
Sensor integration and bench testing	58	Teammates route integration bugs to her
Test plan and verification-and-validation (V&V) matrix	21	Sponsor praised it at the midterm review
Reading papers on crop-stress sensing	17	"Not required — just interesting"
Soldering and rework	12	Tolerable
Slide decks and formatting	9	Disliked; procrastinated
Budget and parts ordering	6	Found it surprisingly satisfying
Kalman-filter tuning for navigation	3	Handed it to a teammate after one evening
Total (Priya)	**126**	109 on team tasks, plus 17 of personal reading
Team average per member	96	Team tasks only (from the task tracker)

2.5 The decision

Priya had twelve days. She suspected that the question was not "which offer is best?" but something she had not yet answered.

Discussion questions

Before reading further, write a short answer to each:

1. Which offer would *you* advise Priya to take today, and why?
2. Whose advice in Exhibit 2 should carry the most weight? Look at who each adviser is before you answer.
3. What is wrong with the goals in Exhibit 3, from an engineering point of view?
4. What does Exhibit 4 tell Priya that none of her advisers could?
5. Exhibit 1 compares the options on ten dimensions. What does it *not* tell Priya, and where would that information come from?

We return to Priya in Chapter 6.

Chapter 3

The Key to Success Is Knowing What You Want

3.1 The question Zelnick asks every mentee

Zelnick's argument

When people ask Zelnick about their careers, he asks them: "What factor is most highly correlated with success?" (p. 17). The usual answers are intelligence, education, competence, ambition, perseverance, talent, passion and luck. He tests them one at a time:

- **Intelligence**: "we all know really smart people who aren't successful at all" (p. 17).
- **Education**: Bill Gates and David Geffen, he notes, never finished their degrees (p. 17).
- **Competence**: "there are plenty of very successful people who appear scattered or disorganized" (p. 17).
- **Ambition**: "undirected ambition yields no special result and, in fact, can be just plain annoying" (p. 18).
- **Perseverance**: "in the absence of a goal or a plan won't get you anywhere" (p. 18).
- **Talent and passion**: each is "necessary but insufficient"; "passion without talent is energy without an engine" (p. 18).
- **Luck**: relying on it is not a sound approach — "If you disagree, put down this book and take the next plane to Las Vegas" (p. 18).

His answer: **"the most important driver of success, and the attribute most common among highly successful people, is: knowing what you want"** — "a focus on one's goals as well as an absence of attention to things that are not of primary importance" (p. 18).

Notice the shape of the argument. Zelnick does not say that talent, effort and education are unimportant. He says they are *magnitudes without a direction*. An engineer recognises the picture at once (Figure 3.1): add vectors pointing in unrelated directions and the resultant is small, however long each vector is. Align them and the same effort accumulates.

Zelnick's examples are people whose success, "even in retrospect, would not have seemed obvious" (p. 17). Haim Saban, whom he met at Columbia Pictures in 1983, had no traditional education, no network and a catalogue of what Zelnick calls "cheap Japanese animation" (p. 20) (in fact largely live-action *Super Sentai* footage) whose business case "made no sense" (p. 19) to Zelnick; in the early 1990s that catalogue became *Mighty Morphin Power Rangers*. "Haim's

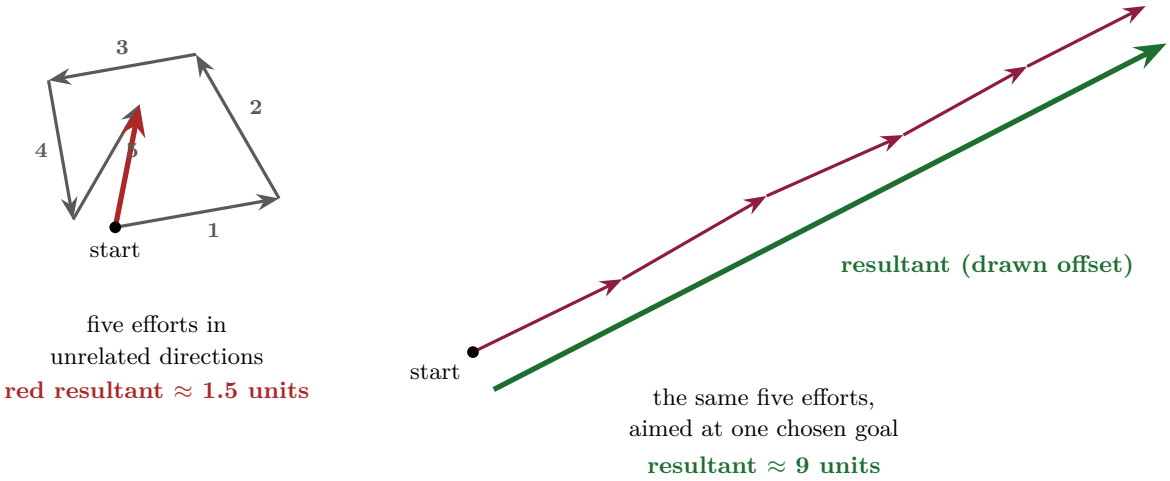


Figure 3.1: Zelnick's central claim as a vector sum. Both panels use the same five efforts (lengths 1.6–2.0 units), drawn at the same scale. Knowing what you want does not add effort; it aligns the effort you already spend.

talent wasn't obvious. His ambitions and goals were" (p. 20). Zelnick says the same about himself: reasonably intelligent, hard-working, persuasive — "None of that distinguishes me from many other people. What I believe differentiates me, though, is that I always knew what I wanted" (p. 21).

What the research says

- **Specific, difficult goals beat "do your best".** Across hundreds of studies summarised by Locke and Latham (2002), specific, challenging goals produced higher performance than vague ones. The mechanisms are the vector picture: goals *direct attention* toward relevant activity and away from irrelevant activity, *energise* effort, and *sustain* persistence.
- **Whose goals they are matters.** Goals that express a person's own interests and values (*self-concordant* goals) receive more sustained effort, are more often attained, and raise well-being when attained; goals adopted to satisfy others do so less (Sheldon and Elliot, 1999).
- **A limit to note.** The goal-setting literature also documents a dark side: narrow, aggressive goals imposed without regard to values can encourage risk-taking and cutting corners (Ordóñez et al., 2009). Zelnick's insistence that goals sit inside your values (Chapter 4) is the safeguard; Lecture 6 returns to it.

3.2 Visualisation: why it works, and why it sometimes does not

Zelnick's argument

Zelnick describes "creative visualization", a practice that "originated in the nineteenth century's New Thought movement"; Wallace Wattles, author of *The Science of Getting Rich* (1910), was, he says, "one of its first proponents" (p. 21). It holds that repeatedly imagining an outcome helps bring it about. Jim Carrey, Zelnick notes, famously visualised

"every morning upon awakening" receiving a $20 million cheque for his acting, and received that fee in 1996 for *The Cable Guy* (p. 20). Zelnick's verdict is careful: "I don't believe for a second that our internal thoughts reorder the outside world. I do believe that any practice that requires you to know what you want and think about it regularly is a powerful tool for reaching your goals" (p. 22). His instruction: "discover your ambition, narrow its scope with as great a degree of specificity as possible, emblazon it on your consciousness and revisit it daily" (p. 22).

What the research says: Zelnick's nuance is the right one

- **Picture the process, not only the prize.** Students who mentally rehearsed the *steps* of studying for an exam studied more and scored higher than students who only pictured themselves receiving a high grade (Pham and Taylor, 1999).
- **Pure fantasy can drain energy.** Positive fantasies about an idealised future reduced energy, measured physiologically as systolic blood pressure, and subsequent effort in experiments by Kappes and Oettingen (2011). Imagining the offer letter feels good and may make you *less* likely to do the work that earns it.

So Zelnick is right for the reason he gives: visualisation helps when it forces you to *specify* the goal and *think about it regularly*. It fails when it becomes a substitute for planning.

3.3 Success defined as "having the life you want"

Zelnick's argument

"I define success differently than many people. I define it as having the life you want" (p. 23). The definition contains "two necessary preconditions: first, knowing what you want; and second, getting it, or most of it, most of the time" (p. 23).

Most people, "especially early on in their lives and careers, tend to think of success in financial and material terms" (p. 23), reinforced by parents, teachers and supervisors. Zelnick is candid that he wanted wealth himself and makes no moral judgement — but "money is generally a fairly poor proxy for success" (p. 23). If you do not really care about wealth, position and accolades, "seeking them is a waste of time and obtaining them will, ultimately, be unfulfilling" (p. 23).

Figure 3.2 draws the definition as a two-stage system.

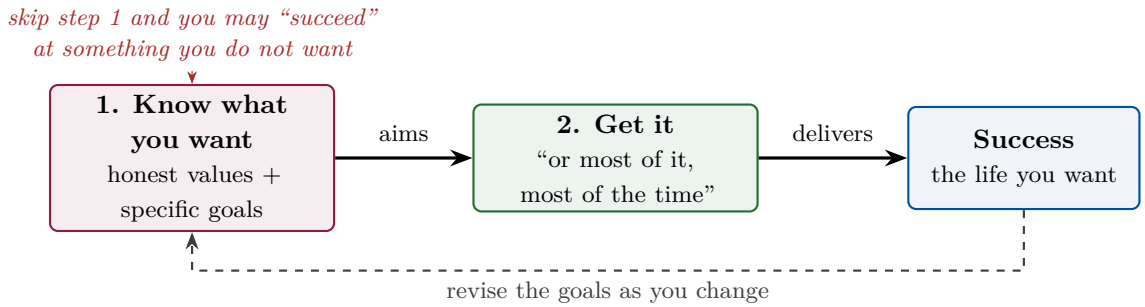


Figure 3.2: Zelnick's definition of success (p. 23) as a two-stage system; the feedback loop reflects his practice of revising goals as his interests evolved (p. 21). Step 1 decides whether step 2 is worth doing.

What Morse, Schell & Babcock add

Morse, Schell & Babcock reach the same point from the career side. Following Morrison and Vosburgh, they note that "a career is defined differently for different people": for the pure professional "the occupation is usually paramount while the link to the organization is tenuous"; for others, career and organisation become one; most engineering careers fall between. "In setting out to manage your own career you need to define what success in a career means to you, because this in turn influences what actions are appropriate" (Morse et al., 2020, p. 365).

3.4 The "If-I-just-get" treadmill

Zelnick's argument

"When we're young many of us engage in an internal game of 'If I just get (fill in the blank) I'll be happy' " (p. 24). Unless the blank reflects your genuine goals, "the sentence will likely turn out to be false"; worse, by the time you discover it you may be "locked into a life and lifestyle that demands that you continue doing what you're doing" (p. 24).

Zelnick describes an acquaintance he calls Peter, who "would do anything, really anything" to become very rich: he cheated, manipulated people, lied and burned bridges. He was already wealthy by most people's standards in his mid-twenties and eventually became a multibillionaire, yet remained "still miserable" (p. 25). Zelnick immediately adds a counter-example: another man he knows, also very rich and no nicer, who is very happy — because when he filled in his blank "he was honest with himself about what he wanted" (p. 25). Money is not the point; honesty about the blank is. Hence his closing question: "What is it that you actually, in your deepest soul, want? Answer that question honestly, and you'll be on your way to a successful life" (p. 25).

What the research says: supports Zelnick, with a nuance

- **Adaptation is real.** In a classic (small) study, lottery winners were not significantly happier than controls some time after their win (Brickman et al., 1978). Later longitudinal work shows that adaptation to many life events is substantial but not always

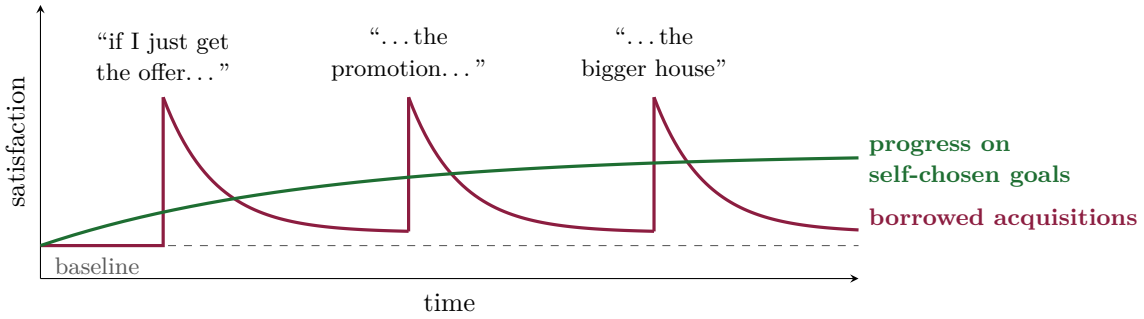


Figure 3.3: The "If-I-just-get" treadmill (schematic, not fitted data). Each acquisition that does not reflect what you value produces a spike that fades back toward, though not always all the way to, baseline (Lucas, 2007); the gains from progress on self-concordant goals tend to last longer (Sheldon and Elliot, 1999). What matters is how long a gain lasts, not the height of its peak.

complete (Lucas, 2007). The direction, not the exact size, is the point.

- **Money as a life aim is a warning sign.** People for whom financial success is a central aspiration, relative to relationships, growth and community, report lower well-being and vitality (Kasser and Ryan, 1993).
- **But money is not irrelevant.** A 2023 "adversarial collaboration" found that for most people experienced well-being keeps rising with income well beyond US$100,000; only for the least-happy minority does it plateau around that level (Killingsworth et al., 2023). Zelnick's wording is exact: money is a *poor proxy* — a measurement that tracks the real variable badly — not a thing of no value.
- **Objective and subjective success are different variables.** A meta-analysis found that salary and promotions (objective success) and career satisfaction (subjective success) have partly different predictors, with different strengths (Ng et al., 2005). People who see their work as a *calling* rather than a job report higher life and work satisfaction (Wrzesniewski et al., 1997).

Figure 3.4 puts the two kinds of success on separate axes.

Engineering translation

Engineers are trained to optimise a stated objective function. The trap is optimising a function someone else wrote. Salary, title and employer brand are easy to measure, so they become the default objective. Ask of every career goal the question a design reviewer asks of a requirement: *who is the stakeholder, and is this their need or mine?*

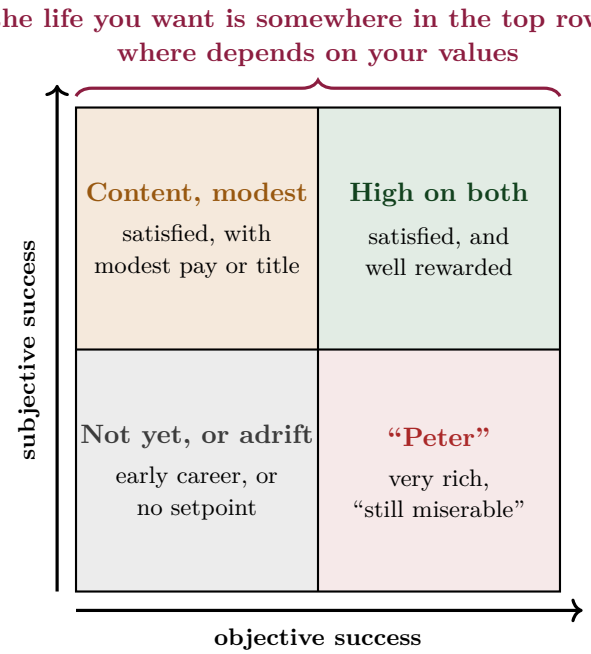


Figure 3.4: Objective success (pay, title) and subjective success (satisfaction, meaning) are separate axes (Ng et al., 2005). Zelnick's definition does not rank the two top cells; it asks which one *you* are aiming at.

3.5 Wanting what you have

Zelnick's argument

Near the end of his book Zelnick turns the subtitle around: "At some point, though, you also need to want the life you have. In our society there's a popular belief that more is better, and that those with more are therefore happier" (p. 159). He describes having the chance, during a downturn, to buy "a much larger property" on very attractive terms, and deciding against it one evening: "I'm happy in this house. … A bigger or more impressive house not only won't make me any happier — I don't want it. In this instance, I want what I have" (p. 160). Applying that principle more widely, he says, keeps us from "making specious choices that don't enhance or improve upon what really matters" (p. 160). Gratitude is his daily practice: "Most days, even the rough ones, I take time to be grateful for all of my good fortune. And that alone makes life sweeter" (p. 159).

What the research says: gratitude and "good enough"

- **Gratitude can be practised,** as Zelnick's daily habit assumes. Participants randomly assigned to record things they were grateful for each week reported higher well-being and more optimism than those who recorded hassles or neutral events (Emmons and McCullough, 2003).
- **"Maximisers" pay a price.** People who habitually seek the best possible option, rather than one that is good enough by their own criteria, report lower life satisfaction and more regret (Schwartz et al., 2002). Knowing what you want lets you recognise "enough" when you reach it.

- **A nuance on wealth.** Zelnick writes that happiness is "largely uncorrelated with wealth or career success, especially after one achieves a basic level of comfort" (p. 159–160). The evidence is more mixed: well-being does rise with income for most people (Killingsworth et al., 2023). What the evidence supports is his practical point — *more* of something you do not value is a poor trade.

Discussion questions

1. Think of a successful engineer you know personally, or one whose career is well documented. Did they seem to know what they wanted early? What evidence do you have either way?
2. Zelnick separates luck from serendipity and probability (p. 37), and several of his stories begin with a chance meeting. How does his distinction explain them? (Lecture 2 takes this up.)
3. Complete the sentence "If I just get _____, I'll be happy." Is the blank a self-concordant goal or a borrowed one? How can you tell?
4. Killingsworth et al. (2023) find that well-being keeps rising with income for most people. Does that weaken Zelnick's "poor proxy" argument, or leave it intact? Why?
5. Where would Priya's three options in Exhibit 1 sit on Figure 3.4? Does the answer depend on whose values you use?

Assignment — Your success definition (Personal Setpoint, Part 1)

Task. In no more than one page:

1. Write your definition of success in one sentence, in your own words, and give one piece of evidence from your capstone, co-op or projects that shows what you actually care about.
2. List three "If-I-just-get" statements you have believed at some point. For each, say whether it is self-concordant or borrowed, and give the evidence for your judgement.
3. Rate yourself today, and as you hope to be in ten years, on both axes of Figure 3.4 (0–10 each). Sketch the two points, justify each rating in one sentence, and explain the path between them in three or four sentences.
4. Describe one *process* you will rehearse mentally this week (not an outcome), in the spirit of Pham and Taylor (1999).

Deliverable and due date. One page, PDF, due at the end of week 1. **Marking (10 marks).**

- *Definition and evidence* (3): 3 — specific enough that a friend could tell whether you had achieved it, with real evidence; 2 — specific but without evidence; 1 — generic ("be happy and successful"); 0 — missing.

- *Classification* (3): for each of the three statements, 1 mark if classified with concrete evidence (where it came from; how you felt when you got something similar), 0.5 if classified without evidence, 0 if missing.
- *Ratings and path* (2): 2 — justified ratings and a path with at least one concrete intermediate step; 1 — ratings unjustified *or* path vague; 0 — both missing.
- *Rehearsal* (2): 2 — a process in steps ("outline the report, then…"); 1 — a vague process; 0 — an outcome ("getting an A").

Chapter 4

Write It Down: Values and Goals as a Specification

4.1 Two lists

Zelnick's argument

"It may seem simplistic, but writing things down helps in any number of ways" (p. 26). Zelnick gives five reasons. Writing lets you *capture, organise and save* your thoughts; it *promotes honesty* — "it's hard to ignore self-delusion when your words are staring back at you"; it *exposes internal conflicts*, which you must resolve to have "coordinated, mutually compatible goals"; it can be *reviewed* against new options and your progress; and, citing Robert Cialdini, writing something down "increases significantly the likelihood that you will actually comply with it" (p. 26).

So make two lists (p. 26–27):

- **Values** — "who you are: the core attributes and aspirations that define your character". The list "shouldn't include what you *think* your values ought to be; it should reflect what your values *are*."
- **Goals** — "what you want: the specific achievements and rewards you hope life will bring you" — financial, professional, charitable or personal, split into near-term and long-term.

Zelnick's procedure is iterative, and it reads like a design review (Figure 4.1).

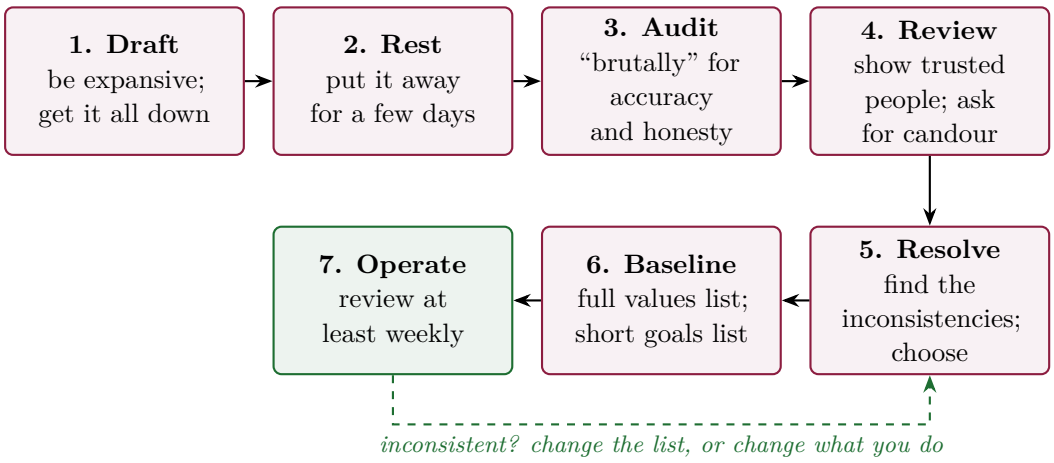


Figure 4.1: Zelnick's values-and-goals procedure (pp. 26–28) drawn as a review cycle. Zelnick repeats the rest-and-edit step more than once before the review; the figure shows it once. Step 4, the review by trusted people, is the step that catches self-delusion.

Three details matter. First, **you own the lists**: when trusted people comment, "you don't need to agree with or accept this feedback: ultimately *you* own these lists, so you are the decision maker" (p. 27). Second, **the payoff is the conflicts**: "if you value taking lots of vacation time and your goal is to be a successful investment banker, something's got to give" (p. 28). Third, **the lists are operated, not filed**. Zelnick keeps his on his phone and reviews them "at least weekly"; if something "jumps out at me as being inconsistent with my priorities … I know I either have to change what I'm doing or change the list" (p. 28). His firm writes goals annually and reviews last year's performance against them at a retreat; "our track record for attaining our annual goals has improved dramatically" (p. 28–29).

Done correctly, "your list of values will include everything in your life that's important to you, and your list of goals will be short and clear. It should also reflect who you are, be consistent with what you're good at and be compatible with what you like to do" (p. 28). That last sentence is the bridge to Chapter 5.

4.2 Why writing works

What the research says

- **A randomised test of goal-writing.** In a small randomised trial (85 students), struggling university students who completed a structured online exercise to write, elaborate and plan their personal goals achieved higher grades and were more likely to remain enrolled full-time than a control group (Morisano et al., 2010).
- **Monitoring progress is itself an intervention.** A meta-analysis of 138 studies found that prompting people to monitor goal progress improved goal attainment, and the effect was larger when progress was physically recorded or reported to others (Harkin et al., 2016). That is Zelnick's weekly review and his firm's annual retreat.
- **Commitment and consistency.** People act to remain consistent with commitments, especially those that are active, public and written (Cialdini, 2021, ch. "Commitment and Consistency") — the mechanism Zelnick cites. (Cialdini's book is a synthesis for general readers of the experimental literature, not itself a peer-reviewed study.)
- **Say when and where.** "Implementation intentions" — if–then plans of the form "when situation X arises, I will do Y" (Gollwitzer, 1999) — had a medium-to-large effect on goal attainment across 94 studies (Gollwitzer and Sheeran, 2006). A goal with no next action is still a wish.

Myth check: the "1953 Yale goals study"

You will meet the story that the 3% of a Yale class who wrote down their goals later earned more than the other 97% combined. When a journalist investigated in 1996, neither the university nor the speakers who repeated the story could produce the study (Tabak, 1996). The story still circulates in motivational books and talks. You do not need it: the real evidence above is more modest and more convincing. When you quote a statistic to a sponsor or a manager, be the engineer who has checked the source.

4.3 The engineering translation: a personal specification

Engineers already know how to turn vague wishes into something testable. A requirements specification distinguishes *constraints* — requirements that limit the solution space and must always hold — from *functional and performance requirements* that state what the design must achieve, and each requirement is written so that it can be verified (ISO/IEC/IEEE, 2018). Zelnick's two lists map closely onto that structure (Figure 4.2). The mapping is not exact, because Zelnick allows you to "adjust your values, knowingly" (p. 33), which a hard constraint would not permit; but it gives you a working discipline.

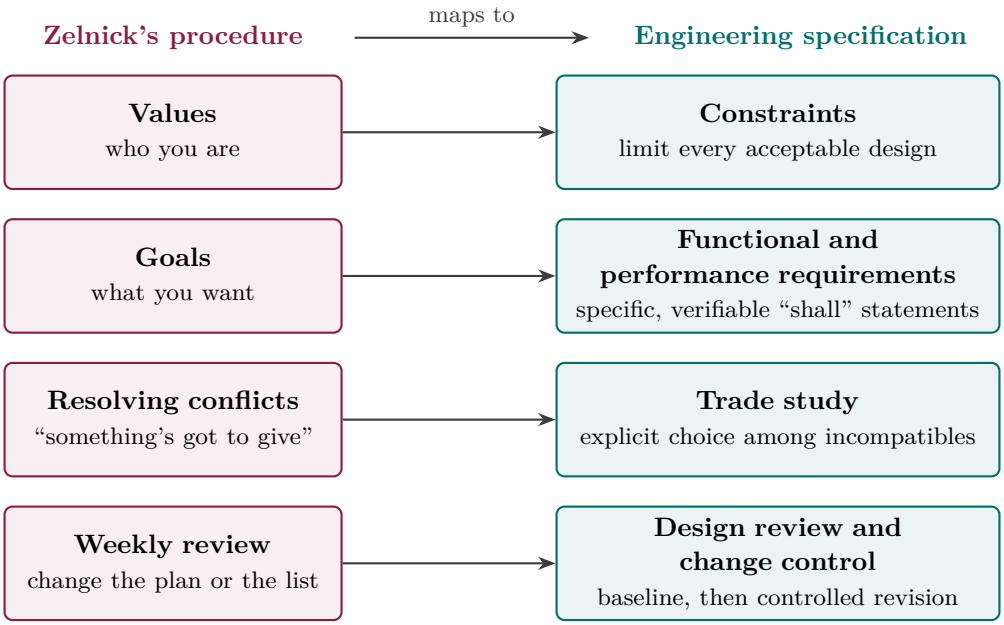


Figure 4.2: Zelnick's procedure mapped onto a requirements specification. Values bound the solution space; goals are the requirements inside it.

The mapping gives you a quality test for every goal. Among the characteristics of a good requirement are that it is necessary, unambiguous, feasible and verifiable (ISO/IEC/IEEE, 2018). Table 4.1 applies that test to Priya's draft goals from Exhibit 3.

What Morse, Schell & Babcock add

Morse, Schell & Babcock place the responsibility where Zelnick does: "Each professional needs to take personal charge of their career, and to determine its direction rather than letting events take their own course" (Morse et al., 2020, p. 383). They add that this means letting your managers know what your career goals are, preparing yourself for them, and asking for the transfers or assignments that move you toward them — a written goals list is what makes that conversation possible.

Capstone move

Your capstone team has a requirements document. Does it separate constraints from requirements, and is every requirement verifiable? Apply the same review to your team charter: what are the team's values (constraints on how you work) and goals (what you will deliver)? If you cannot write them down, you do not yet agree on them.

Table 4.1: Priya's six draft goals (Exhibit 3) rewritten as verifiable requirements.

Draft goal	Problem	Rewritten as a verifiable goal
"Be successful"	Not verifiable; restates the question	Delete: success is the whole specification, not one line of it.
"Earn $150k by 30"	Borrowed from a forum; not tied to any value	"Repay my $22,000 student loan by December 2028 and hold six months' expenses in savings by 2030."
"Lead a robotics product someday"	No date, no first step	"Own one robotics subsystem from requirements to release by 2029; be the named technical lead of a robotics product by 2033."
"Get my P.Eng."	Nearly verifiable already; needs a feasible date	"Register as an Engineering Intern at graduation (2027); pass the professional practice exam by 2028; apply for the P.Eng. once I can show all the required competencies."[a]
"Maybe start a company"	Not a goal yet — an option to explore	Move to a dated test: "By 2028, validate one product idea with ten potential customers; decide then."
"Do something that matters"	Ambiguous; checkable only at retirement	"My next two roles are on environmental-sensing products" — in effect a constraint on roles, and one that depends on resolving the conflicts in Chapter 6.

[a] Professional Engineers Ontario cut its minimum experience from four years to two on 1 July 2026, but notes that applicants need three to four years on average to show all 34 required competencies (PEO, 2026). A 2029 application is possible; 2030–31 is more typical.

Discussion questions

1. Zelnick insists the values list must describe who you *are*, not who you think you should be. Why does an idealised list fail in practice? Which item in Priya's values list (Exhibit 3) might be idealised?

2. Name a values–goals conflict that is common among engineering graduates. How would you resolve it with a trade study rather than a mood?

3. Zelnick's firm improved its goal attainment "dramatically" after starting annual reviews. What else might explain the improvement? How would you test the claim?

4. Who would you show your lists to, and who would you *not*? Why?

Assignment — Your values and goals (Personal Setpoint, Part 2)

Task. Follow steps 1–6 of Figure 4.1 over at least five days (for example: day 1 draft; day 3 audit; day 4 review; day 5 resolve and baseline).

1. Draft both lists expansively (step 1) and keep this draft.
2. After a rest of at least two days (step 2), audit and revise them (step 3).
3. Show the lists, or the parts you are comfortable sharing, to two people you trust. Record one suggestion you accepted and one you rejected, with reasons (step 4).
4. Identify at least two conflicts and document how you resolved each (step 5).
5. Produce the baseline (step 6): a full values list, and a goals list of no more than six items, each rewritten to pass the test in Table 4.1.

Deliverable and due date. Up to two pages: draft lists, baseline lists and a half-page change log. Due at the end of week 2. You may submit the values list in summary form if it contains private matters; a summarised value still needs one example to earn the grounding mark.

Marking (15 marks).

- *Grounded values list* (2): each value is backed by one example of how you spent time or money in the last month (2); some values backed (1); none backed (0).
- *Iteration* (2): at least three reasoned changes between draft and baseline (2); changes without reasons (1); no visible change (0).
- *Peer review* (3): one accepted and one rejected suggestion, each with a reason (3); both listed but only one reasoned (2); listed without reasons (1); none (0).
- *Conflicts* (3): two genuine conflicts, each resolved by an explicit choice of what to give up (3); one resolved (2); conflicts named but not resolved (1); none (0).
- *Goal quality* (5): every goal is specific, dated and verifiable (5); one mark lost for each goal that fails the Table 4.1 test (minimum 0).

Chapter 5

The Sweet Spot: Talent, Passion and Opportunity

5.1 When you cannot name your goals

Zelnick's argument

"Most of us have very little trouble writing down our list of values" (p. 29). Goals — especially professional ones — are harder. For people who are stuck, Zelnick offers a second exercise: find "your optimal profession at the intersection of your talent, passion and a specific opportunity" (p. 29).

- **Talent**: "the thing or things at which you are uniquely good. Not moderately good, not competent" (p. 29).
- **Passion**: "the things you care about deeply ... the things you'd do all the time if you could, the things you don't need to get paid to do" (p. 29).
- **Opportunity**: "the specific market, or potential market, for your talent and what you're passionate about" (p. 29).

Each alone "is insufficient to develop a set of realistic, achievable and ultimately rewarding goals" (p. 30). "Talent in a vacuum is like singing in the shower: you may sound terrific, but only you are there to hear it"; "Follow your bliss" is "silly advice" (p. 31). Speaking for himself: if his passion were painting but he were a terrible painter, and his values included feeding his family and sending his children to college, "then I almost certainly shouldn't try to be a professional artist" (p. 31).

Figure 5.1 redraws Zelnick's diagram with one addition: the frame of values that he insists every candidate must fit inside.

Zelnick's own example is simple. If you love tennis, play superbly (though not well enough for the professional circuit) and "there are tennis professional jobs available", "becoming a tennis pro might well be in your sweet spot". But then comes the constraint: "your values cannot include making a lot of money, because tennis pros can earn a good living but don't generally become rich" (p. 30).

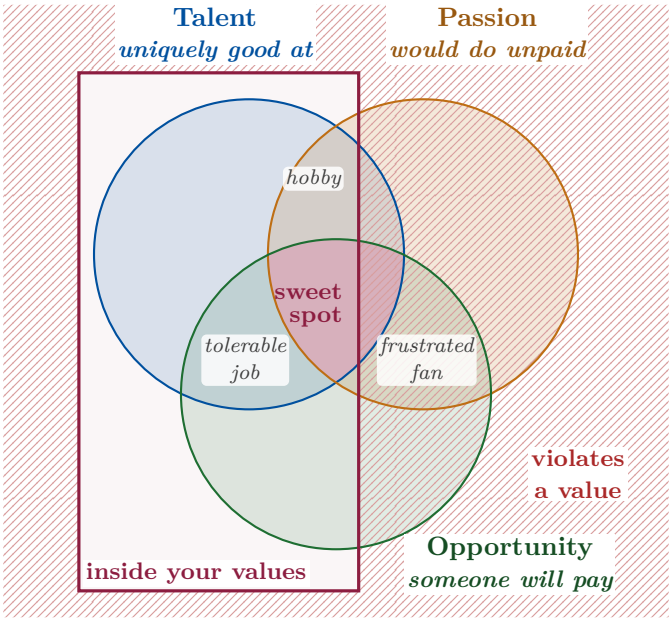


Figure 5.1: Zelnick's "Finding your goal" diagram (after his Figure 1, p. 30), redrawn with his values constraint made explicit. Parts of every circle fall outside the values frame (hatched): a role can sit in the sweet spot and still violate a value. The pairwise overlaps show what you get with only two of the three circles; those labels are this lecture's additions, not Zelnick's. Here the frame cuts through the sweet spot: only the part on the left, inside the frame, is an acceptable goal.

5.2 Opportunity can be made

Zelnick's argument

At BMG, Zelnick met a young pianist whose solo-piano album seemed, to him, commercially unlikely. Over dinner he learned that the artist had a marketing background, was "personally calling hundreds of radio stations", and had planned his own campaign so that "whether our label supported him or not, he'd have the best possible shot at success". The pianist was Jim Brickman, who went on to sell millions of albums. Was he the most talented composer on earth? "No. … But he was certainly talented enough and he exploited that talent with his unique marketing skills and an enormous ambition for success. And, as it turns out, the market opportunity was there as well" (p. 31–32).

The lesson Zelnick draws: following your passion, even with talent, "may not be sufficient … There also has to be an opportunity — or you have to create one" (p. 31).

What the research says

- **Fit is real and measurable.** A meta-analysis of 172 studies found that person–job and person–organisation fit predict job satisfaction, commitment and intention to stay (Kristof-Brown et al., 2005). The Venn diagram is a fit model.
- **Interest congruence predicts performance.** Across more than 60 years of research, the congruence between people's vocational interests and their work predicted job performance and persistence (Nye et al., 2012). Passion, in this sense, is not a luxury.

- **Passion is often developed, not found.** People who believe interests are fixed and waiting to be "found" lose interest faster when a subject becomes hard and explore less widely (O'Keefe et al., 2018). People who believe passion is *developed* place less weight on initial fit when choosing a job and expect to develop passion over time; in the studies of Chen et al. (2015), they reported comparable well-being at work later on, despite starting with lower fit. This supports Zelnick's scepticism about "follow your bliss" — and warns you not to rule out a field because your first course in it was hard.
- **Not all passion is healthy.** *Harmonious* passion (freely chosen, integrated with the rest of life) is associated with positive outcomes; *obsessive* passion (compulsive, conflicting with other commitments) with rigid persistence and conflict (Vallerand et al., 2003), and at work with a higher risk of burnout (Vallerand et al., 2010). The values frame in Figure 5.1 is what keeps passion harmonious.
- **"Uniquely good" is partly built.** Expert performance depends heavily on extended, effortful, feedback-rich practice (Ericsson et al., 1993), though a later meta-analysis found that practice explains only part of the differences in performance, and less in professions than in games or music (Macnamara et al., 2014). Your talent circle is not fixed at graduation, but it is not infinitely elastic either.

Myth check: "follow your passion and the money will follow"

Zelnick calls the advice silly, and the evidence is on his side for two reasons. First, many people do not have a single, pre-existing passion waiting to be discovered; interests grow with competence and exposure (Chen et al., 2015; O'Keefe et al., 2018). Second, passion without a market is a hobby (Figure 5.1). The defensible version is: *develop* a passion where your talent is growing and someone will pay for the result.

5.3 The opportunity circle for engineers

What Morse, Schell & Babcock add

Morse, Schell & Babcock (after Leonard Smith) list the broad career fields that an engineering degree opens (Morse et al., 2020, pp. 365–366): **operational** careers (manufacturing, purchasing, planning, customer service, sales); **research and design**; **engineering management**; **entrepreneurial**; **consulting**; **writing**; **academic**; and **other** careers that use engineering problem-solving outside engineering. They note that about two-thirds of engineers have traditionally spent the last two-thirds of their careers with some management responsibility.

They also summarise Super's career stages, including an *establishment* stage whose first five years are "a trial period in which one or two changes in the field of work would be made" (Morse et al., 2020, p. 366); Super's original age ranges are dated, and Morse, Schell & Babcock note that the stages can occur at widely varying ages (Morse et al., 2020, p. 367). Changing course early is normal, not failure — which is exactly why Zelnick treats the lists as living documents.

2026 context: reading the opportunity circle

The opportunity circle moves fastest. Employers surveyed for the 2025 *Future of Jobs* report expected roughly 39% of core job skills to change by 2030. The fastest-growing skills were technological (AI and big data, networks and cybersecurity, technological literacy), alongside creative thinking and resilience; analytical thinking remained the most sought-after core skill (World Economic Forum, 2025). The evidence on AI is mixed and specific to setting. In one large field study of customer-support agents, an AI assistant raised productivity most for the least experienced workers (Brynjolfsson et al., 2025); in a randomised trial, experienced open-source developers were about 19% *slower* with early-2025 AI tools (Becker et al., 2025); and in the United States, employment of 22–25-year-olds in AI-exposed occupations stood about 19% below where it would have been had it kept pace with less-exposed peers, as of mid-2026 — a descriptive, not causal, estimate (Brynjolfsson et al., 2026). The author's reading for new engineers: some routine entry-level tasks are shrinking, so the opportunity circle may reward judgement and verification more than before — and it moves too fast to read once. Revisit it at every job change.

Table 5.1 pairs some demand areas, with Canadian examples where they help, with the talent each rewards and a typical first role. It is the author's illustrative selection, informed by World Economic Forum (2025), not a forecast: test it against your own Venn diagram and against people working in the field, and check current demand yourself in job postings and government labour-market outlooks.

The question to ask of any passion is Zelnick's: *who will pay for this talent, and why?* If the honest answer is "nobody yet", decide whether you will create the opportunity (as Brickman did) or keep it as a hobby.

Capstone move

Your capstone is the best evidence you will have this year of your own talent and passion. Keep a two-column note for the rest of term: tasks teammates bring to *you* (talent signal) and tasks you do before they are due because you want to (passion signal). Ask your sponsor which parts of your work they would pay for (opportunity signal).

Table 5.1: Illustrative demand areas for engineering graduates, the talent each rewards, and a typical first role. The rows are the author's examples; check their current status before relying on them.

Demand area	Talent it rewards	Typical first role
Embedded and edge-AI hardware	FPGA/SoC design, real-time firmware, power budgets	Firmware or FPGA design engineer
Energy transition and the grid (for example, Ontario's nuclear refurbishments)	Power electronics, protection, controls, standards	Protection and controls engineer-in-training
EV and battery supply chain (several Canadian projects delayed or cancelled since 2025)	Battery management systems, manufacturing automation, quality engineering	Battery-management validation or manufacturing engineer
Robotics and automation	Mechatronic integration, functional safety, machine vision	Controls or integration engineer
Space robotics and Earth observation (for example, Canadarm3 contracts)	Reliability, thermal and structural analysis, RF, systems engineering	Assembly, integration and test engineer
Medical devices	Verification and validation, regulated software, quality systems	V&V or software quality engineer
Software platforms and AI tools	Test automation, verification of AI-generated code, security, ML operations	Software engineer in test; ML-operations engineer

5.4 Checking the sweet spot against your values

Zelnick's argument

"Once you've found your own sweet spot it's time to return to your list of values to make sure the two are consistent" (p. 33). If you are passionate about food, a talented chef and have a head for business, a restaurant might look obvious — but "if your values include sleeping late and having your weekends free, you probably won't like the restaurant business. Something, then, has to give" (p. 33). Choices will require compromises, and "It's better to make them up front and embrace that decision than to find out well down the road that you've made a choice that's in conflict with what you want or how you wish to live your life" (p. 33).

"Unless and until your own Venn diagram is clear, easy to follow and devoid of inconsistencies — both in itself and with your values — you cannot complete this exercise. And until you do, there's no point in trying to be successful at anything. As my old friend Al Angrisani says, 'If you don't know where you want to go, any old path will get you there' " (p. 33).

Figure 5.2 turns the exercise into a sequence of gates. Each "no" says what to do next; the Venn region in brackets is where you are *if the other circles hold*. The final gate is Zelnick's values check.

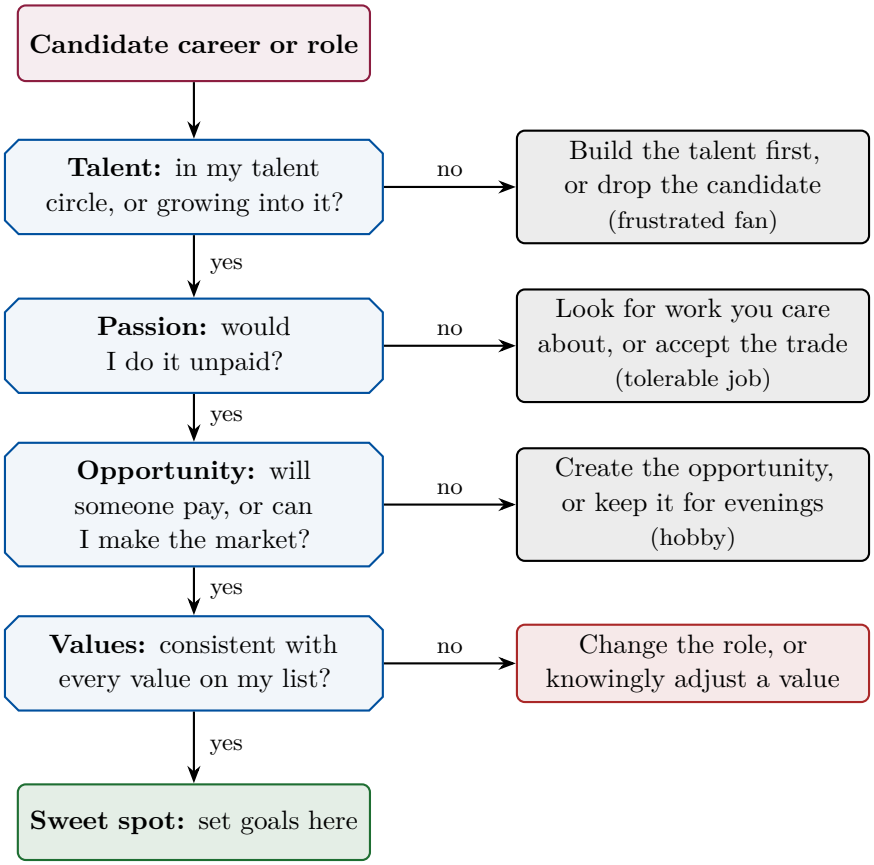


Figure 5.2: The sweet-spot test as a sequence of gates (after Zelnick, pp. 29–33). The final gate — consistency with your values — is the one Zelnick insists on (p. 33). Region names in brackets assume the other two circles hold.

Discussion questions

1. Zelnick demands that talent be *uniquely* good, while research suggests talent is partly built (Ericsson et al., 1993; Macnamara et al., 2014). Are these views compatible? What does "uniquely good" mean for a 22-year-old engineer?

2. Brickman created his own opportunity. Give an engineering example of someone who created a market for a talent rather than waiting for one.

3. Using Exhibit 4, fill in Priya's three circles. Which of her three options sits closest to the sweet spot, and which of her values does it strain?

4. Is the opportunity circle something an individual can read reliably alone? Who can help you read it, and what should you ask them?

Assignment — Your sweet spot (Personal Setpoint, Part 3)

Task.

1. Draw your own Figure 5.1. Put three *specific* entries in each circle (not "coding" but "writing deterministic firmware for motor control"), each backed by evidence from your capstone, co-op or projects.

2. Name two candidate roles or fields in the intersection. Run each through the gates of Figure 5.2 and record where, if anywhere, it fails.

3. For the stronger candidate, identify one person already working in that field and write the question you would ask them about the opportunity circle. (Optional bonus: ask it, and report the answer in three sentences.)

Deliverable and due date. One page plus the diagram (hand-drawn and photographed is fine), due at the end of week 3. Then bind Parts 1–3 together with a half-page summary ("what I want, in one paragraph") as your *Personal Setpoint* (about five pages in total). Keep it: Lecture 2 builds on it.

Marking (15 marks, including 3 for the binding summary of the whole Personal Setpoint).

- *Circle entries* (5): nine specific, evidenced entries (5); lose one mark for every two vague or unevidenced entries (minimum 0).
- *Gate analysis* (5): both candidates through all four gates with reasons (5); both candidates, but one gate passed that the evidence shows should fail (for example, no market for the role in the region you have committed to) (4); only one candidate analysed, with reasons at every gate (3); both candidates, but more than one gate passed against the evidence (2); gates listed without reasons (1); missing (0).
- *Practitioner question* (2): a question only a practitioner could answer (2); a question answerable by a web search (1); missing (0).
- *Summary* (3): one paragraph consistent with Parts 1 and 2 (3); consistent but generic (2); inconsistent with an earlier part (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Priya which offer to take; it tells her what to do first.

6.1 What the exhibits show

- **Exhibit 1 is an output without a setpoint.** Every row compares the options on a dimension, but nothing says how much each dimension matters to Priya. That weighting is exactly what her values list should supply.

- **Exhibit 2 is five people's setpoints, not hers.** A parent who valued security, a roommate who chose a start-up, a researcher, a Northfield veteran and a founder who needs a hire: each recommends what fits *their* values. Zelnick's warning applies directly: not "what your parents told you that you should want" (p. 25). The advice is useful information about each option, not a decision.

- **Exhibit 3 fails the specification test.** "Be successful" is not verifiable; "$150k by 30" is borrowed; "close to my family in Ottawa" conflicts with the only environmental *job* offer, which is in Guelph; and "weekends free for climbing" conflicts with Terrasense's 50–60-hour weeks. "Always learning something hard" may be partly idealised: Exhibit 4 shows she handed the hardest unfamiliar task (Kalman-filter tuning) to a teammate after one evening — although her 17 hours of unrequired reading point the other way. Step 3 of Figure 4.1 exists to settle exactly this. None of this is a flaw: it is a first draft, which is what step 1 produces.

- **Exhibit 4 is evidence none of her advisers had.** Priya logged 109 hours on team tasks against a team average of 96, plus 17 hours of reading. The log points to a talent for integration and verification, a passion for environmental sensing (17 unrequired hours of reading), and an unexpected interest in budgets — a hint that operational or entrepreneurial fields are open.

- **The money question is real but bounded.** Priya has $22,000 in loans and wants to help her parents retire. The salary gap between Northfield and Terrasense ($16,000 a year) matters; the MASc's two years of forgone salary matter more. As Killingsworth et al. (2023) suggest, money is not irrelevant — but it is one weighted dimension of a setpoint, not the setpoint itself.

6.2 A worked sweet-spot analysis

Table 6.1 shows one reasonable reading of Priya's three circles and how each option fares at the gates of Figure 5.2. No option passes every gate.

Table 6.1: One reading of Priya's sweet spot, using the evidence in Exhibits 1–4.

Gate / criterion	Northfield	Terrasense	MASc
Talent (integration, V&V)	Strong fit	Strong fit	Partial: research skills untested, though she reads papers voluntarily
Passion (environmental sensing)	Weak for environmental sensing; strong for integration work	Strong	Strong
Opportunity	Certain	Uncertain (18 months of cash)	Certain for two years
Values (those in tension)	Family ✓; security ✓; weekends ✓; environment ×	Family ×; security ∼ (18-month runway); weekends ×; environment ✓	Family ✓; security × (loans deferred); weekends ✓; environment ✓
Values (others)	Learning: steady; respect: formal program	Learning: steep but unstructured; respect: early responsibility	Learning: deep, narrow; respect: publications
P.Eng. path (goal)	Clear	Unclear	Delayed, partial credit possible

That is normal, and it is why Zelnick says "something, then, has to give" (p. 33). The decision becomes an explicit trade study: which value is Priya willing to adjust, knowingly, and for how long?

6.3 One defensible sequence

1. **Buy time honestly.** Ask Northfield whether the deadline can move by a week, and say why: the five-day list exercise fits in twelve days, but the conversations in step 4 below may not. If Northfield says no, she compresses the list exercise into a weekend and makes the step 4 calls by phone.

2. **Run steps 1–5 of Figure 4.1** over the next five days; show the lists to one person with no stake and to one parent (whose reaction is data about the parent's hopes, too).

3. **Resolve the geography conflict** explicitly: is "close to family" a value about distance, or about time spent together? The answer decides whether Guelph is acceptable.

4. **Test the opportunity circle** with two short conversations: a Northfield engineer two years into the rotation, and a current MASc student. Ask Terrasense how it will fund the next eighteen months.

5. **Choose, and write down the review point.** Whatever she chooses, she writes what would make her revisit the choice in two years — the subject of Lecture 2.

> **The one-sentence version of this lecture.** Decide what you want before you decide where to work: write your values and goals down, test them like a specification, find where talent, passion and opportunity meet inside those values, and review the result often enough to notice when it needs to change.

Glossary

Calling
An orientation to work as meaningful in itself, as opposed to a job (for pay) or a career (for advancement) (Wrzesniewski et al., 1997).

Constraint
A requirement that limits the solution space and must hold in every acceptable design (ISO/IEC/IEEE, 2018). Here: your values.

Deliberate practice
Effortful practice designed to improve performance, with feedback (Ericsson et al., 1993).

Goal-setting theory
The finding that specific, difficult goals raise performance by directing attention, energising effort and sustaining persistence (Locke and Latham, 2002).

Harmonious / obsessive passion
Passion that is freely chosen and fits with the rest of one's life, versus passion that is compulsive and conflicts with it (Vallerand et al., 2003).

Hedonic adaptation
The tendency for the emotional effect of a gain or loss to fade toward a baseline over time (Brickman et al., 1978; Lucas, 2007).

If-I-just-get game
Zelnick's name for believing that one more acquisition will bring happiness (p. 24).

Implementation intention
An if–then plan linking a situation to a goal-directed action (Gollwitzer, 1999).

Maximiser / satisficer
Someone who seeks the best possible option, versus one who chooses the first option that meets their own criteria (Schwartz et al., 2002).

Objective vs subjective career success
Externally measurable outcomes (pay, promotions) versus one's own satisfaction with one's career (Ng et al., 2005).

Opportunity cost
The value of the best alternative given up by a choice (a standard economics term).

Person–job and person–organisation fit
The match between a person and a job's demands and rewards, or an organisation's values (Kristof-Brown et al., 2005).

Proxy (variable)
A measurable quantity used in place of the variable you care about; a poor proxy tracks it badly. Zelnick calls money a poor proxy for success (p. 23).

Requirement
A verifiable statement of what a design must achieve (ISO/IEC/IEEE, 2018). Here: your goals.

Self-concordant goal
A goal that expresses one's own interests and values rather than external pressure (Sheldon

and Elliot, 1999).

Setpoint
The reference value a control system tracks. Here: your written values and goals.

Sweet spot
The intersection of talent (what you are uniquely good at), passion (what you would do unpaid) and opportunity (what someone will pay for), constrained by your values (pp. 29–33).

Trade study
A documented comparison of incompatible alternatives against weighted criteria, ending in an explicit choice (NASA, 2016).

Verification and validation (V&V)
Checking that a design meets its specification (verification) and that it meets the user's actual need (validation) (NASA, 2016).

Instructor Notes

Purpose and timing

This 80-minute session opens the series. Its job is to make "knowing what you want" concrete and engineering-shaped, and to launch the *Personal Setpoint* document that later lectures build on. The case is set in early November, when students are receiving offers; run the session then, or ask students to imagine it is November. Materials: index cards for the anonymous "If I just get" exercise, and a printed copy of Table 4.1 with the right-hand column blank.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Hand vote: Northfield, Terrasense or MASc. Record the split. Ask one student from each group for their single strongest reason.
10–25	Whose setpoint?	Read Exhibit 2 aloud, including who each adviser is. Ask which adviser's values each vote reflected. Introduce Zelnick's question and Figure 3.1.
25–40	Success defined	Figures 3.2 and 3.4. Anonymous cards: "If I just get…". Read three aloud; discuss the Killingsworth nuance.
40–55	Lists as a specification	Rewrite two of Priya's goals live using Table 4.1. Show the Yale myth check.
55–70	The sweet spot	Students sketch a rough Venn diagram in two minutes, then run one candidate role through Figure 5.2 with a neighbour.
70–80	Close	A 2–3-minute debrief of Chapter 6 (one defensible sequence, not the answer). Re-vote on the case; ask who changed their vote and why. Assign Part 1 of the Personal Setpoint.

Sections 3.2 (visualisation) and 3.5 (wanting what you have) are reading-only; refer to them in the 25–40 segment if time allows.

If the first vote does not split, ask the majority to argue the strongest case for the option nobody chose; the point of the case is the reasoning, not the answer.

Talking points for every discussion question

Case (Chapter 2)

Q1: collect the vote; do not resolve it. Q2 is a deliberate trap: students rank advisers by seniority; steer them to notice that each recommends what fits their own values or interests. Q3: vague, borrowed and conflicting goals. Q4: evidence of talent and passion from behaviour, not opinion. Q5: Exhibit 1 has no weights — the values list supplies them, and it says nothing about how reversible each choice is.

Chapter 3

Q1: ask for evidence, not impressions; note survivorship bias (we hear about the successful).

Q2: Zelnick distinguishes luck ("magic") from serendipity and probability (p. 37); Lecture 2 develops this. Q3: borrowed blanks often trace to a parent, a peer group or social media. Q4: a correlated variable can still be a poor *definition* of success. Q5: the answer changes with the weights — the central lesson.

Chapter 4

Q1: idealised values produce goals you will not pursue, so the weekly review keeps failing; Priya's "always learning something hard" is the example. Q2: common conflicts are location versus opportunity, and pay versus mission; a trade study names what is given up. Q3: regression to the mean, a better market year, easier goals — a lesson in evaluating anecdotes. Q4: choose people who know you and have no stake in the outcome; think twice about whom *not* to show (people with a stake, such as a parent who wants a particular choice), or show them knowing that their reaction is data about them as well as about you.

Chapter 5

Q1: "uniquely good" at 22 usually means "better than peers at something specific, and improving fastest there". Q2: examples include engineers who built a product for a niche they understood (for instance, adaptive tools for a family member) and then found customers. Q3: see Table 6.1. Q4: practitioners, alumni, co-op managers and recruiters; ask what they hire for and what they cannot find.

Marking guidance

A strong Part 1 names a success definition that a friend could check, with evidence; a weak one says "be happy and successful". A strong Part 2 shows visible change between draft and baseline and at least one conflict resolved by giving something up. A strong Part 3 has nine evidenced circle entries and at least one honest "no" at a gate. Values lists may be submitted in summary form; never mark the *content* of a student's values, only their grounding and specificity.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. His case for knowing what you want rests on decades of watching people succeed and struggle; the controlled studies on goal setting and progress monitoring point the same way (Harkin et al., 2016), which is a good exercise in seeing a practitioner's observation confirmed.

2. On happiness and wealth (pp. 159–160), later research adds detail about income and well-being (Killingsworth et al., 2023); his central point, that wanting what you have is a choice, stands and is the one to teach.

3. Some of the illustrations are told as he remembers them (Bill Gates's years at Harvard, p. 17; Saban's early programming and Jim Carrey's cheque, p. 20). Other published accounts differ in small details; none affects the lesson, and checking them is a useful habit in its own right.

None undermines his argument, and spotting them models the habit of checking sources.

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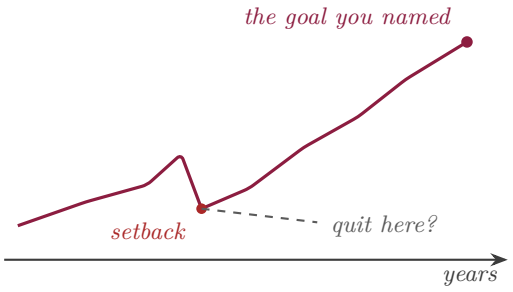
Success as an Engineer — Professional Practice Series

Lecture 2

Ambition, Priorities and the Long Game

Aiming high, choosing what matters and staying the course

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Burn-Through (mechanical / aerospace)
Year:	2026



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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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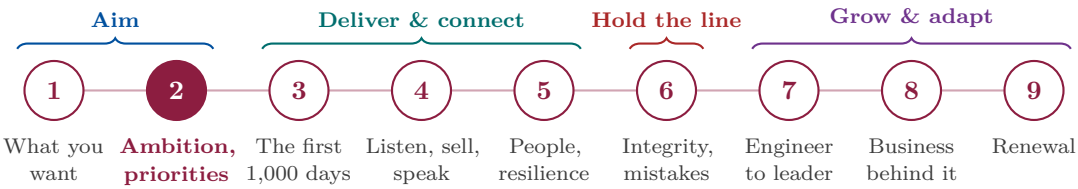
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Chapter 1

About This Lecture



Lecture 1 ended with a *Personal Setpoint*: a written statement of what you want. This lecture asks three harder questions. Will you say it out loud and act on it, knowing you might fail? With more worth doing than hours to do it, what comes first? And when the first serious setback arrives — it will — do you hold course, or change it?

Learning objectives

By the end of this lecture you will be able to:

- **Explain** why capable people hide their ambition, and what the research on approach and avoidance goals, self-handicapping and regret says about the cost.
- **State** an ambitious goal and turn it into a time-boxed test with review points decided in advance.
- **Prioritise** a crowded list with Zelnick's impact–difficulty grid, correct for the known biases in estimating difficulty, and build a weekly time budget that fits in 168 hours.
- **Distinguish** perseverance from escalation of commitment, and use kill criteria and a pre-mortem to decide whether to persist or pivot.
- **Place** your first decade in the career stages engineers typically pass through.
- **Produce** your *Two-Year Plan*: three short parts, built across the chapter assignments, that turn your Personal Setpoint into priorities and checkpoints.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument. Three of its short chapters matter here: "Own Your Ambition", "Setting Priorities" and "Perseverance". Zelnick practised what they preach: he left a secure path to build a media-investment business from nothing and says plainly that he expected the odds to be against him.

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: how engineers manage time when there is always more work than hours, and the career stages through which engineering professionals typically grow.

Peer-reviewed research tests both. Where it supports Zelnick you will see the study; where it limits or corrects him, you will see that too.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Two-Year Plan

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Daniel's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Two-Year Plan**: Part 1 (an ambition statement and a first test of it, due at the end of week 1), Part 2 (your priorities and a weekly time budget, due at the end of week 2, after a week of logging your time) and Part 3 (checkpoints, kill criteria and a pre-mortem, due at the end of week 3). It builds on the Personal Setpoint from Lecture 1; if you did not complete that, write a half-page version first.

Chapter 2

Case Study: The Burn-Through

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what final-year engineering students describe. It is set in January 2027, in the winter term that follows this lecture.

2.1 Monday 18 January 2027, 7:15 a.m.

Daniel Mensah, a fourth-year mechanical engineering student in Ottawa, sat in the design-team workshop with a coffee and a burnt piece of aluminium on the bench in front of him. It was the aft closure from the team's hybrid rocket motor. Five weeks earlier, 3.4 seconds into a planned seven-second static fire, hot gas had found its way past an O-ring and cut a slot through it. No one was hurt; the stand was built for exactly that. But the load cell, the plumbing and most of the team's confidence had gone with it.

Daniel was chief engineer of the Rideau Aerospace Design Team, which aimed to fly its first student-designed motor at a national launch competition in August 2027. He had joined the team in first year, sweeping metal chips. Now twenty-one people — down from thirty-four in September — were waiting to hear what he would propose.

He had two other decisions to make. The first was an application. **Aurora Orbital**, a Montreal launch-vehicle start-up, ran a two-year propulsion development program for new graduates: ten places, and, according to an alumna he had met at a conference, about 800 applicants last year. Applications, including a technical portfolio, closed on Friday 5 February. Daniel had not started. "People who get those jobs have straight-A transcripts and internships at big-name launch companies," he told his roommate. His average was a B, and his one co-op term had been with an HVAC contractor.

The second was a fallback he had not asked for. His uncle, who ran a building-controls firm in Ottawa, had offered him a job starting in June: sensible pay, weekends free, "and you'd be running projects in three years". Daniel had told friends he would "probably just take it". He had not told anyone that what he wanted, since he was fourteen, was to design engines that put things in orbit.

2.2 Everything, all at once

Daniel kept a list on his phone. He had written it in September and updated it that morning (Exhibit 1).

Exhibit 1 — Daniel's commitments, January 2027, with his own estimates

Commitment	Hours/week	Note
Rocketry: chief engineer	22	Failure review, redesign, team morale
Four courses (excluding capstone)	24	Heat transfer, controls, machine design, an elective
Capstone: automated pump-test fixture	12	Team of four; final demonstration on 9 April
Teaching assistant, thermodynamics labs	8	Paid; helps with a $31,000 student loan
Learning CFD (OpenFOAM) on his own	4	"For the nozzle, eventually"
Gym	4	
Team social media and outreach	3	Nobody else wants to do it
Intramural soccer	3	Friday nights
Aurora Orbital application	0	Portfolio needs about 15 hours in total
Hackathon, 13–14 February	—	A one-off 30 hours; he had promised a friend
Total, recurring	**80**	

He also had a log. After the failure, the team's faculty adviser had asked every sub-team lead to record their hours for a week, to see where the effort was going. Daniel's own week is in Exhibit 2.

Exhibit 2 — Daniel's logged week, 11–17 January 2027

Activity	Planned	Actual	Note
Rocketry	22	40	Failure review; four nights past 1 a.m.
Courses	24	24	One assignment handed in late
Capstone	12	9	Teammates covered; one sent a pointed message
Teaching assistant	8	8	
CFD self-study	4	0	
Gym	4	2	
Social media and outreach	3	4	Posted a "we'll be back" video
Soccer	3	3	
Aurora application	0	0	Opened the form twice
Total	**80**	**90**	Sleep averaged 6.1 hours a night, against 7 planned

2.3 The test record

The current motor design had been Daniel's project since third year. Exhibit 3 shows the four static fires of the current design.

Exhibit 3 — Static-fire record, hybrid motor "Kestrel"

Test	Objective	Result	Cost
1 — 12 Oct 2026	Ignition; 2-second burn	Clean ignition; chamber pressure 22% low (fuel port too large)	$420
2 — 2 Nov 2026	5-second burn	4.8 seconds; pressure oscillations of ±18%	$610
3 — 23 Nov 2026	Redesigned injector; 6 seconds	6.1 seconds; stable; 94% of predicted total impulse	$540
4 — 12 Dec 2026	Full duration; 7 seconds	Gas leak past aft O-ring at 3.4 seconds; closure, load cell and plumbing destroyed	$3,900
Spent on the motor since September 2025 (including hardware)			**$14,800**
Volunteer time since September 2025: about 2,300 hours across the team.			

On Thursday the faculty adviser, Dr Hélène Martel, had set out the choice (Exhibit 4).

Exhibit 4 — Email from the faculty adviser, 14 January 2027

Daniel — testing stays paused until the failure review is signed off. The team then has two realistic options for August:

(A) Fix and re-test the Kestrel motor. Your draft review says the O-ring groove was machined 0.3 mm oversize and the seal was never checked after test 3. A corrected closure, a new load cell and two more static fires: about ten weeks and $4,500, if nothing else goes wrong. You would fly in the student-designed-motor category, which scores more points.

(B) Buy a certified commercial motor ($2,400) and fly in the off-the-shelf category. Lower risk, fewer points, and the motor work stops for this year.

Procurement lead times mean I need the team's decision by 1 February. Whatever you choose, I want to see the reasoning, not just the preference. — H.M.

2.4 The message

On Sunday night Daniel had messaged the Aurora alumna he had met at the conference, Kiran Bhatt, a propulsion engineer two years into the program. He had half-hoped she would tell him not to bother. She replied at 6:40 a.m. (Exhibit 5).

Exhibit 5 — Message from Kiran Bhatt, 18 January 2027

Honestly? Your average is not the problem. Nobody in my cohort had a perfect transcript. What we have in common is that we built hardware, broke it and could explain exactly why. A burn-through with a root cause and a fix is a better portfolio story than a test that worked. The people who don't get in are mostly the people who don't apply. Deadline is the 5th. Send me a draft by the 1st and I'll read it.

Daniel put the burnt closure back in its bag. He had three weeks, three decisions and no spare hours.

Discussion questions

Before reading further, write a short answer to each question.

1. Should Daniel apply to Aurora Orbital? What, specifically, is he afraid of?
2. Using Exhibits 1 and 2, what should he stop doing this term? Name at least two items.
3. Should the team fix the Kestrel motor (option A) or buy a commercial motor (option B)? Which facts in Exhibit 3 matter most, and which should not matter at all?
4. The team has shrunk from thirty-four to twenty-one. What does that tell Daniel, and what does it not tell him?
5. What would have to be true in two years for Daniel to say the choices he makes this week were right?

We return to Daniel in Chapter 6.

Chapter 3

Own Your Ambition

3.1 The ambition you do not say out loud

Zelnick's argument

"When talking about setting goals, I've often noticed that some people are reluctant to express overt ambition. This includes high achievers in school as well as many successful executives. Why? Very simply, they are either embarrassed or, more commonly, they are afraid of failure" (p. 34).

His answer is direct: "In my view it's much better to try — knowing you may fall short — than not to try at all. Moreover, if your goal is indeed highly ambitious, and you pursue it avidly, even if you don't achieve it fully you will likely be closer to it than if you hadn't tried in the first place" (p. 34).

Zelnick illustrates this with a young woman who told him, "it's not like I think I could be president of the United States or anything." His reply: "Why can't you be president? You are intelligent and capable and you attended a top school. Moreover, you're only twenty-four." He then sketched a path — local council, state representative, Congress or governor — and noted that this "was more or less Bill Clinton's approach. You can substitute almost any dream here and chart an appropriate path" (pp. 34–35). The point is not the presidency. It is that an ambition becomes workable the moment it has a first step.

Daniel's case is the same pattern at engineering scale. He has wanted to design launch-vehicle engines for years, tells friends he will "probably just take" the safe job, and has opened the Aurora application twice without writing a word.

What the research says: why people hide ambition, and what it costs

- **Avoidance goals hurt performance.** Students who adopted *performance-avoidance* goals ("don't do worse than others") performed worse and enjoyed the work less than those who adopted *approach* goals ("master this", "do well") (Elliot and Church, 1997). Figure 3.1 shows the four goal types that later work distinguished (Elliot and McGregor, 2001).
- **Self-handicapping protects the ego, not the outcome.** People unsure they can repeat a success will sometimes create an obstacle in advance — in the classic experiment with male students, choosing a drug they were told would impair performance — so that failure can be blamed on the obstacle (Berglas and Jones, 1978). "I never really tried" is the everyday version, and Daniel's unopened application is a candidate.
- **Belief matters, but it is not magic.** Across 114 studies, self-efficacy — confidence

that you can perform a specific task — correlated about 0.38 with work performance (Stajkovic and Luthans, 1998). That is a real effect, and it is also far from a guarantee.

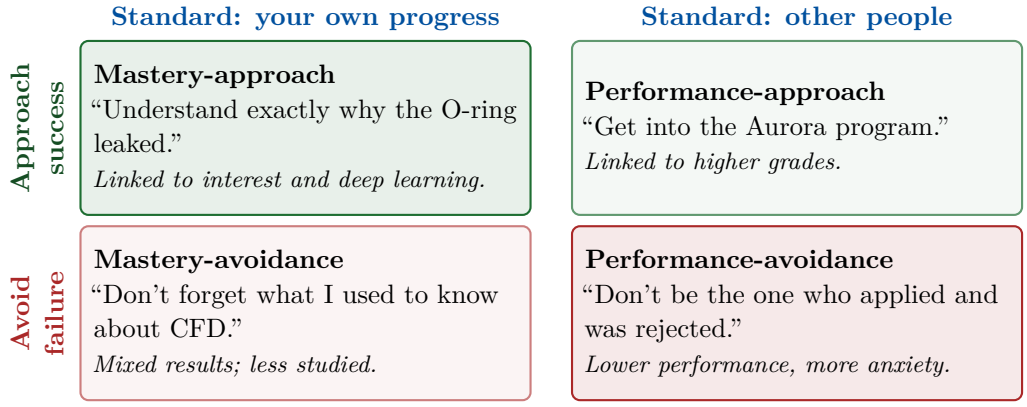


Figure 3.1: Four kinds of achievement goal, after Elliot and McGregor (2001), with examples from Daniel's case. Zelnick's reluctant high achievers are often pursuing the bottom-right goal without noticing it. The outcome notes summarise Elliot and Church (1997) and Elliot and McGregor (2001).

3.2 Why trying beats not trying

Zelnick's claim has a precise shape. If you do not try, the result is known in advance: "It is absolutely clear that if you don't try in the first place you know what the result will be: indeed, consciously or not, you've made the choice" (p. 38). If you try avidly, the outcome is uncertain, but most of its range lies above where not trying leaves you. Figure 3.2 draws the two cases.

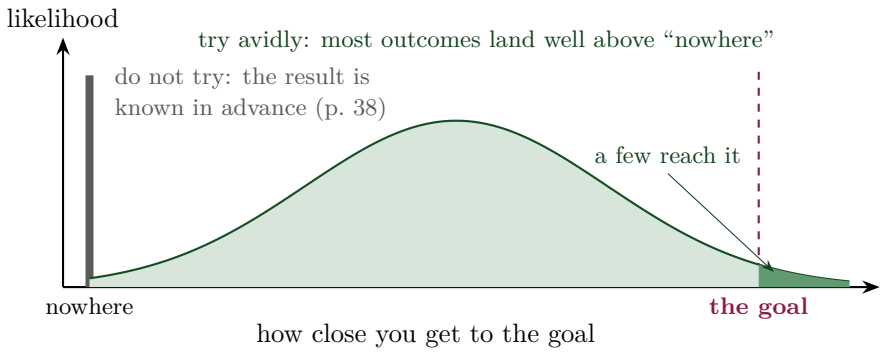


Figure 3.2: Zelnick's argument for trying, drawn as two outcome distributions (schematic, not data). Not trying fixes the outcome; trying spreads it, and most of the spread lies closer to the goal. The cost of trying — time, money, the chance of a visible rejection — is real and is what the rest of this lecture helps you budget.

The figure also shows what the argument does *not* say. It does not say that trying is free. Daniel's portfolio will take fifteen hours from a week that is already full, and rejection by a program with 800 applicants for ten places is the most likely single outcome. Zelnick's point is that those costs should be weighed openly, not avoided by never deciding.

Myth check: "Whether you think you can, or you think you can't, you're right"

Zelnick quotes Henry Ford: "if you think you can do it, or you think you can't do it, you are right" (p. 38). The saying is widely credited to Ford, though its exact origin is hard to trace (Quote Investigator, 2015). Zelnick uses it for the half that matters most: believing you cannot do something makes it likely that you will not try, which settles the outcome. The myth is the stronger reading, that belief alone makes you able. Believing you can helps — the self-efficacy correlation above is real — and then the work still has to be done. That is how Zelnick uses the line: as a reason to try, followed by a book about how to do the work.

3.3 "What do you really want?"

Zelnick's argument

Zelnick once advised a recent graduate who wanted to be an actress but was looking for a job in public relations near her parents' home in Connecticut, so as not to "do menial work" while she waited for a break. He told her that acting required a job with flexible hours in New York or Los Angeles, then asked, "What do you *really* want? Because there's nothing magical about success. There is an element of serendipity, true, and acting is a tough profession to break into, and not many people are ultimately successful. But I can pretty much guarantee you that if you stay in Connecticut and work in PR you will never be an actress" (pp. 36–37).

And the general rule: "You need to be willing to act on your ambition even as you understand that there is a meaningful risk you won't achieve it" (p. 35).

The actress had an ambition but had chosen a path that made it impossible. That is common, and it is rarely a conscious choice. Daniel's version is subtle: by not applying, he has made the Aurora outcome certain while telling himself he has only postponed a decision.

Zelnick adds a distinction worth keeping. In a footnote he separates *serendipity*, "a chance occurrence", from *luck*, which "reflects the belief that chance occurrences are magical. I believe in probabilities. I do not believe in magic" (p. 37). An engineer would put it this way: you cannot control the draw, but you can decide how many draws you take and where.

3.4 Time-box the attempt: the two-year test

Zelnick's argument

Zelnick applied the rule to his own career. Entering the entertainment business, "I was aware that, even if I did everything right, there was a significant chance I would not achieve my goals." He did not want "life to pass by while I stood on the sidelines with nothing more to show for my efforts than a fading fantasy. So I decided to give it two years, assess my progress and, if necessary, consider an alternate course" (p. 37). Two years later things were going well enough to continue.

Years afterwards he saw that if he did not start his own business then — in his early forties, with the résumé he had built — he never would, and proceeded, "recognizing that I had one

shot at my life; that I have a finite span of time ahead of me; and that realistic dreams are indeed worth chasing" (p. 37). He writes that he knew "the odds were that I'd fail" (p. 35).

The two-year test is the most engineering-like idea in this part of the book: a bounded experiment with a review date fixed in advance. Figure 3.3 shows its structure.

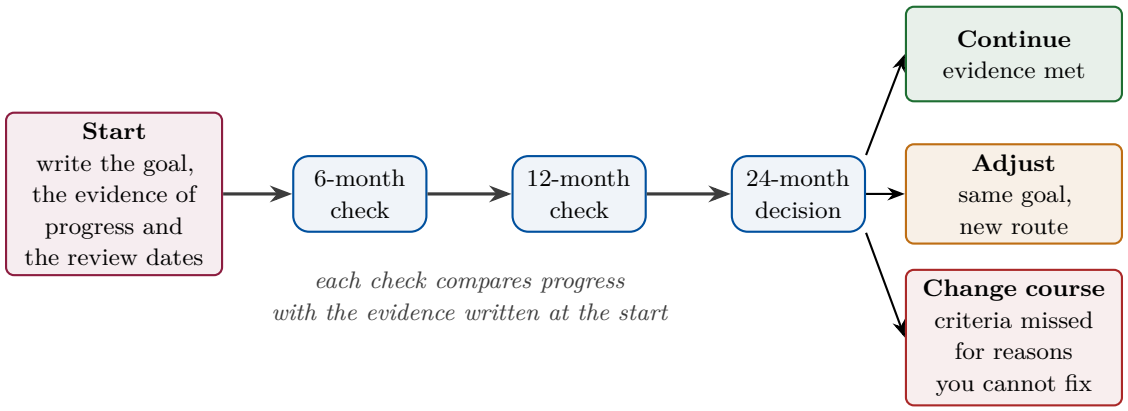


Figure 3.3: Zelnick's two-year test (p. 37) drawn as a time-boxed experiment. What makes it work is writing, *before* starting, what progress should look like at each check. The three outcomes and the interim checks are this lecture's elaboration.

Engineering translation

Engineers already run projects this way. A phase-gate review compares a project against criteria agreed at the start, and a test plan states its pass criteria before the test. The same discipline protects a career experiment from two opposite errors: quitting at the first bad month, and drifting for a decade because no one ever asked whether it was working. Chapter 5 returns to the second error, which has a name: escalation of commitment.

3.5 "You're mortal but I'm not mortal"

Zelnick's argument

"We human beings are wired to believe we have all the time in the world to achieve our dreams" (p. 35). Zelnick calls this "you're mortal but I'm not mortal": the belief that time does not matter "may protect us from feelings of pointlessness but it also gives some people an excuse not to be driven and focused" (pp. 35–36). The risk is "waking up one day and finally realizing it's just not going to happen, not because we failed but rather because it just became too late to try" (p. 38).

What the research says: regret supports Zelnick, with a timing twist

- **Inaction is regretted longer.** In the short term people regret actions that went badly more than things they failed to do; those regrets fade, while regrets about *inaction* persist and, looking back over years, dominate (Gilovich and Medvec, 1995). Figure 3.4 sketches the pattern.

- **We regret most where we had a real chance.** Education and career topped Americans' lists of regrets, and the strongest regrets were in areas where people had seen a clear opportunity to act (Roese and Summerville, 2005). Early career is exactly such an area.

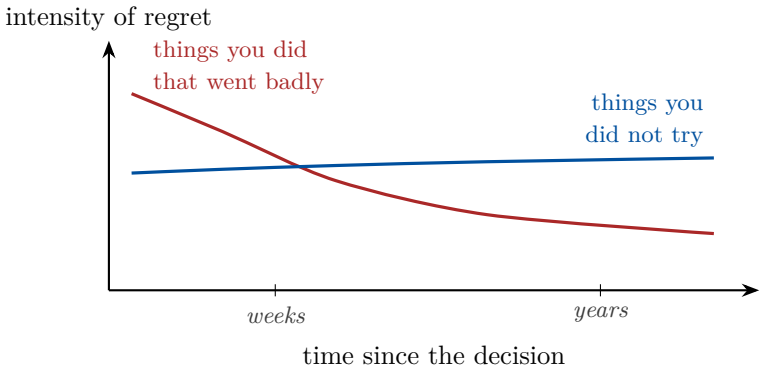


Figure 3.4: The temporal pattern of regret reported by Gilovich and Medvec (1995), drawn schematically (the curves are illustrative, not data): regret for actions fades, while regret for inaction persists and so comes to dominate.

For Daniel, the asymmetry is stark. A rejected application stings for a few weeks. Not applying to the one program built for what he has wanted since he was fourteen is the kind of inaction people are still describing decades later.

Capstone move

Say your capstone's most ambitious realistic outcome out loud to your team — a paper, an award, a sponsor adopting the design — and agree one concrete step towards it this week. If it feels embarrassing, notice that the embarrassment is the avoidance goal at work.

Discussion questions

1. Think of a goal you have kept private. Which of the four cells of Figure 3.1 describes how you have been thinking about it?
2. Zelnick says that if you pursue a highly ambitious goal avidly you will "likely be closer to it" even if you fall short (p. 34). When is that false? Think of goals where falling short leaves you worse off than not trying.
3. Is self-handicapping ever rational? Where is the line between protecting yourself and sabotaging yourself?
4. Design Zelnick's two-year test for an engineering start-up you might found. What evidence would you expect at six, twelve and twenty-four months?

Assignment — Your ambition, stated and tested (Two-Year Plan, Part 1)

Task. In no more than one page:

1. Write one professional ambition for the next ten years that you would hesitate to say aloud. Make it specific enough that someone else could tell whether you achieved it.
2. List the two fears that most discourage you from pursuing it, and classify the goal behind each using Figure 3.1. For each, say what you would lose by *not* trying.
3. Write the first concrete step you will take within five days, and take it. Record what happened in two or three sentences.
4. Design a two-year test for the ambition (Figure 3.3): the evidence of progress you expect at six, twelve and twenty-four months, written now.

Deliverable and due date. One page, PDF, due at the end of week 1.

Marking (10 marks).

- *Ambition* (2): specific and checkable (2); a direction without a checkable outcome (1); missing (0).
- *Fears* (3): both fears classified correctly, each with the cost of not trying (3); both classified, but a cost missing (2); fears listed without classification (1); missing (0).
- *First step* (2): a step taken, with an honest report of the result (2); a step planned but not taken, with a reason (1); missing (0).
- *Two-year test* (3): evidence at all three checks is observable and written in advance (3); at two checks (2); vague milestones (1); missing (0).

Chapter 4

Setting Priorities

4.1 Zelnick's grid

Zelnick's argument

"When you complete your list of goals you may find that it's pretty long, perhaps long enough that it seems daunting to address them all. There's a simple tool that can help you establish priorities that applies as well to many business situations. We use it at our firm when approaching a turnaround, for example" (p. 39).

"Draw a four-square box with the X axis labeled 'Difficulty' and the Y axis labeled 'Impact.' " (p. 39). Then: "Start with the ones that are easy to achieve … and have a high impact. Then turn to those that are easy to achieve and have a low impact. Then focus on those that are hard to achieve and have a high impact. As for the ones that are hard to achieve and have a low impact, don't bother" (p. 40).

Zelnick admits he could not find who invented the tool; "It's often attributed to McKinsey & Company" (p. 39). Figure 4.1 redraws his grid and places Daniel's commitments on it as one reasonable reading of Exhibits 1–5.

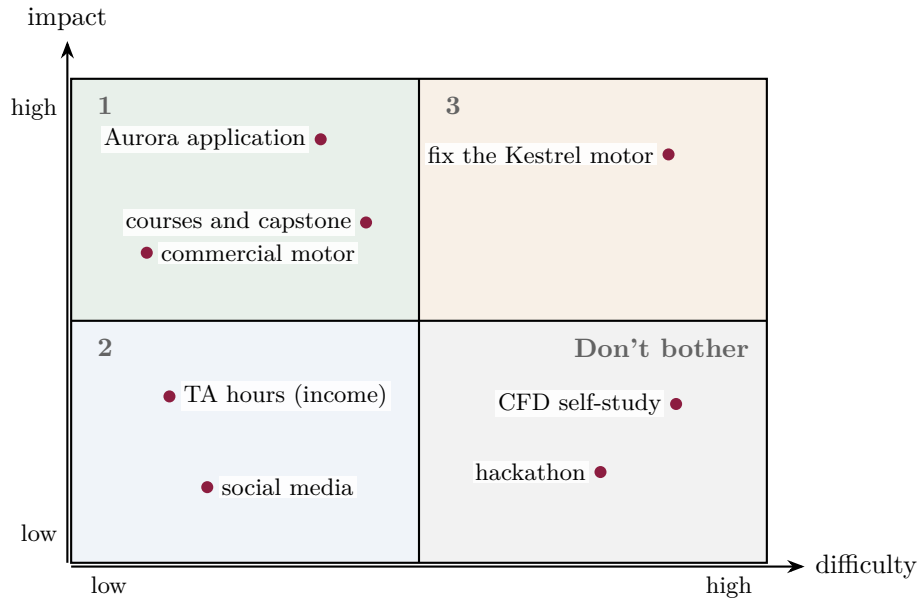


Figure 4.1: Zelnick's impact–difficulty grid (after his Figure 2, p. 39), numbered in his order of attack, with Daniel's commitments placed as one reasonable reading of Exhibits 1–5. "Impact" here means impact on Daniel's goals, including the team he leads; the placements are judgements, and Table 4.1 gives the reasons.

4.2 An engineer's reading of the grid

The grid is a two-criterion decision matrix, and it inherits the strengths and the weaknesses of any decision matrix. Its strength is that it forces a comparison: every item must be placed relative to every other. Its weaknesses lie in the inputs and in the ordering.

The inputs are estimates, and estimates of difficulty are biased. Zelnick's grid asks you to judge how hard each goal is. People systematically underestimate that.

What the research says: difficulty is underestimated

- **The planning fallacy.** Honours students predicted they would finish their theses in about 34 days on average; they took about 56, and only about 30% finished by the date they had predicted (Buehler et al., 1994). Merely recalling past tasks did not help; predictions improved only when people explicitly linked their past record to the new estimate.
- **Engineering practice agrees.** Reference-class forecasting — estimating from the actual record of similar past projects rather than from the plan — exists for this reason (Flyvbjerg, 2006).

Daniel's own record is a reference class. Tests 1–4 in Exhibit 3 were about three weeks apart, and option A needs a rebuild and then two more firings: at that pace, nine or ten weeks if every step goes right. Dr Martel's estimate of "about ten weeks … if nothing else goes wrong" is the optimistic end of that record.

The ordering has a trap. Zelnick puts "easy, low impact" (quadrant 2) *before* "hard, high impact" (quadrant 3). For a turnaround, where quick wins buy time and credibility, that is sensible. For an engineer's week it is risky: easy tasks expand to fill the time, and the hard, important work never starts. Morse, Schell & Babcock make the same warning, quoting Amos and Sarchet on engineering managers: without priorities, they "will constantly put second things first by default" (Morse et al., 2020, p. 386). A practical rule is to schedule quadrant 3 work first, in protected blocks, and cap quadrant 2 with a fixed time box.

Engineering translation

The grid does not tell you what to drop; it tells you where to look. Its most useful output is the "don't bother" quadrant, because that is where a crowded schedule gets its hours back. For Daniel, the hackathon (30 hours in February) and CFD self-study (valuable later, not this term) are the obvious candidates. Dropping them is not failure; it is the grid working.

Table 4.1: Daniel's commitments placed on the grid: impact on the goals in his setpoint, and difficulty in time, cost and risk this term. One reasonable reading; the reasons matter more than the ratings. Options A and B are alternatives, not two tasks.

Commitment	Impact	Difficulty	Quadrant	Reason and action
Aurora application	High	Low	1	Fifteen hours for the one path built for his ambition. Low effort to apply, whatever the odds of getting in. Do it first.
Courses and capstone	High	Moderate	1	Graduation depends on them, and teammates are already covering for him. Protect the hours.
Commercial motor (B)	High (team)	Low	1	Guarantees the team a flight for $2,400; low value for his own engine ambition, and ends the motor work for this year.
Fix the Kestrel motor (A)	High	High	3	High value, but the test record says ten weeks is optimistic. Only with a plan and kill criteria (Chapter 5).
Teaching assistant	Moderate	Low	2	Income against a $31,000 loan. Keep, capped at eight hours.
Social media and outreach	Low	Low	2	Hand to a newer member.
Hackathon	Low	High	Don't bother	Thirty hours in the worst month: tell the friend now.
CFD self-study	Low now	High	Don't bother	Worth doing after April, not this term.
Gym and soccer		*not placed*		Maintenance, not goals: the energy the rest runs on. Keep both (gym trimmed to three hours), and keep sleep above seven hours.

4.3 Three things well

Zelnick's argument

"Remember, it's not possible to do everything, certainly not all at once and probably not well." Kevin Ryan, whom Zelnick describes as founder of DoubleClick and Gilt Groupe, "believes one can do only three things well at the same time. Years ago he decided that his priorities are family, work and fitness." Friends, reading and films became "secondary or tertiary". Zelnick's verdict: "He has the life he wants, but he doesn't have *everything*. Having it all is a fantasy, and an immature one at that" (p. 40).

The number three is a rule of thumb, not a law. The evidence behind the idea — that attention spread across many goals is attention wasted — is strong.

What the research says: supports Zelnick

- **Switching costs time.** Every switch between tasks carries a time cost, and the cost grows with the complexity and unfamiliarity of the tasks (Rubinstein et al., 2001).

- **Attention lingers.** People who leave a task unfinished to start another carry "attention residue" and perform worse on the new task (Leroy, 2009).
- **Conflicting goals wear you down.** People whose personal goals conflicted with one another reported more negative feelings and more physical complaints, and acted on their goals less (Emmons and King, 1988).
- **Focus shields the goal.** When a goal is active, people suppress competing goals, and this "goal shielding" helps them attain it (Shah et al., 2002).

Myth check: "Good engineers can multitask"

The belief persists because switching feels productive: many things move a little. The evidence above says the opposite for demanding work. Batching similar tasks, closing messages during design work and finishing a task before starting the next are cheap ways to get the switch costs back. The exception is routine work that needs little attention, which is why answering email while a long simulation runs is fine.

4.4 Work smarter, not longer

What Morse, Schell & Babcock add

Morse, Schell & Babcock open their section on managing time with a leveller: "Time is a very democratic resource: The prince and the pauper both have exactly the same amount to spend in a day" (Morse et al., 2020, p. 386). Quoting Amos and Sarchet, they warn that "being busy is simple … but being effective is difficult", and that "the solution is not working long hours. Instead, it is setting priorities" (Morse et al., 2020, p. 386).

They also summarise two practical tools (Morse et al., 2020, p. 387): David Allen's *Getting Things Done* cycle (collect, process, organise, review, do), and LeBoeuf's survey of 50 engineering managers, whose ten top time wasters were: inadequate, inaccurate or delayed information; ineffective delegation; telephone interruptions; meetings; unclear communication; crises; leaving tasks unfinished; indecision and procrastination; drop-in visitors; and lack of self-discipline.

Exhibit 2 shows a familiar pattern. Daniel's plan was already full, and when the crisis came rocketry took eighteen extra hours and outreach one more. Nine came out of the capstone, CFD and the gym; the other ten used up his four hours of slack and six hours of sleep. A plan with almost no slack converts every crisis into lost sleep or a let-down team. Figure 4.2 shows his planned week against a week that fits.

What the research says: what time management does, and does not, do

- **A moderate boost to performance, a bigger one to well-being.** A meta-analysis of the time-management literature found that time-management practices were moderately related to job performance, and more strongly related to well-being, especially life satisfaction, than to performance (Aeon et al., 2021).

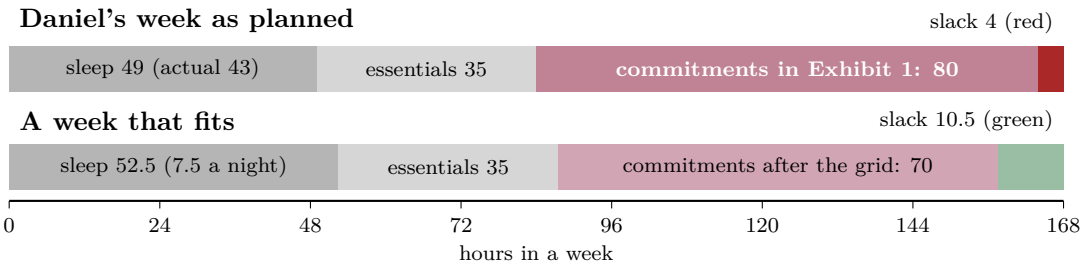


Figure 4.2: A weekly time budget. Top: Daniel's plan from Exhibit 1, with seven hours of sleep a night and five hours a day for meals, travel and chores: four hours of slack. In the crisis week (Exhibit 2) the commitments rose to 90 hours, the slack vanished and sleep fell to 43 hours. Bottom: one week that fits after applying the grid (drop the hackathon and CFD, hand off social media, cap rocketry at 15 hours and the gym at 3, add 5 hours a week for the Aurora application for three weeks: 70 hours in all). The slack is not idle time: it is the buffer that absorbs the next crisis.

- **Writing a plan frees the mind.** Unfinished goals intrude on attention; making a specific plan for them removes most of that intrusion, even before the goal is done (Masicampo and Baumeister, 2011). This is one reason Allen's "collect" step works.

Capstone move

At your next team meeting, place every open capstone task on Zelnick's grid in ten minutes. Agree the quadrant 3 task that gets protected time this week, and one "don't bother" task to drop or defer, and write both in the minutes.

Discussion questions

1. Zelnick attacks "easy, low impact" before "hard, high impact". When is that order right, and when is it a trap? Give one example of each from engineering work.
2. Kevin Ryan's three priorities are family, work and fitness. Is three the right number for a final-year student? What would your three be this term?
3. Is "impact" one quantity? Daniel's TA hours have high impact on his finances and low impact on his ambition. How should the grid handle goals that serve different values?
4. Which of LeBoeuf's time wasters (Morse et al., 2020, p. 387) costs your capstone team the most time? What would remove it?

Assignment — Your priorities and your week (Two-Year Plan, Part 2)

Task.

1. Log your time for seven consecutive days in half-hour blocks (any app or paper).
2. List every current commitment and goal. Place each on Zelnick's grid and give a one-line reason for each placement, as in Table 4.1.
3. Name your three priorities for this term and at least two items you will stop, hand off or defer. Tell anyone affected, and record their response.
4. Build a weekly budget like Figure 4.2 that fits in 168 hours with at least seven hours of sleep a night and at least ten hours of slack.

Deliverable and due date. Two pages plus the time log, as one PDF, due at the end of week 2.

Marking (15 marks).

- *Time log* (3): seven complete days (3); four to six days (2); fewer (1); missing (0).
- *Grid* (4): every item placed with a reason that refers to your setpoint (4); most items with such reasons (3); about half (2); placements without reasons (1); missing (0).
- *Priorities and stops* (4): three priorities and at least two stops, with the people affected told (4); the same, but only some people told (3); stops named but no one told (2); priorities without any stops (1); missing (0).
- *Budget* (4): fits in 168 hours with sleep and slack as specified, and is consistent with the log (4); consistent with the log but short of the sleep or slack targets (3); fits but ignores the log (2); does not fit (1); missing (0).

Chapter 5

The Long Game

5.1 Nothing worth having is easy

Zelnick's argument

"Nothing worth having is easy to obtain. The only people who achieve overnight success are other people" (p. 56). Zelnick's estimate: "In business, I'd estimate that the minimum period of time between inception and liquid success (which is to say, cash in the bank) is ten years" (p. 56). Microsoft was founded in 1975 and went public eleven years later. "The predecessor company to AOL was founded in 1978. Steve Case joined the company in 1983. The company went public in 1992. It took the company fourteen years and Steve nine to achieve liquid success" (p. 56).

"There are outliers, of course: Apple went public in only four years … But, in general, projects worth pursuing take a long time, and most things of value take longer than you expect to get right" (pp. 56–57). "Success in business is much more likely to be a function of the relentless pursuit of narrowly focused goals" (p. 57).

Other histories date Control Video Corporation, the AOL predecessor that Case joined, to 1983 (Swisher, 1998); on either dating, the path to success took the better part of a decade. Research on start-ups supports Zelnick's larger point.

What the research says: success usually comes later than the stories suggest

Using administrative data on 2.7 million US founders, Azoulay et al. (2020) found that the mean age of founders of the fastest-growing new firms (the top 0.1%) was about 45, and that prior experience in the same industry strongly predicted success. The overnight successes you hear about are the exceptions; the news selects for them.

What Morse, Schell & Babcock add: careers grow in stages

Morse, Schell & Babcock summarise Dalton and Thompson's four career stages for professionals: apprentice, colleague, mentor and sponsor. The new professional learns to be an effective subordinate who does routine assignments well "yet aggressively searches out new and more challenging tasks"; leaving this stage too early means the individual "does not learn from the experience of others". Many professionals stay in the colleague stage for the rest of their careers, and 80 percent of those who reach the mentor stage were seen as above-average performers after age 40 (Morse et al., 2020, p. 367). Figure 5.1 places the stages on a career.

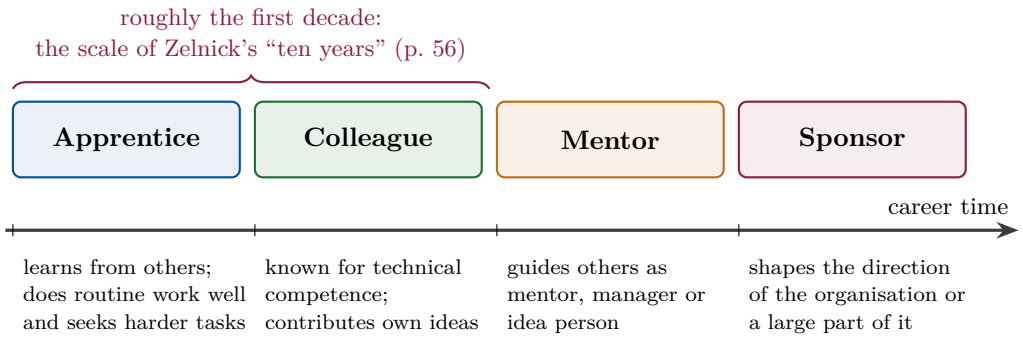


Figure 5.1: Dalton and Thompson's four career stages for professionals, as summarised by Morse, Schell & Babcock (2020, p. 367). The stages have no fixed ages, and many professionals remain colleagues for their whole career; the brace, which is this lecture's addition, shows only the rough scale of the first decade.

Myth check: the "10,000-hour rule"

Zelnick cites Malcolm Gladwell's popular observation that most successful people "practice their skills for ten thousand hours" (p. 57). The figure comes from a study of violinists by Ericsson et al. (1993), where it was an *average* for the best students by age twenty — who were not yet masters. Ericsson himself objected that there is nothing magic about the number (Ericsson and Pool, 2016). A meta-analysis found that deliberate practice explained about 26% of the variance in performance in games, 21% in music, 18% in sports, 4% in education and less than 1% in professions (Macnamara et al., 2014). Zelnick's own conclusion is the one the evidence supports: hard, focused work is "a necessary, if insufficient, condition" (p. 57).

5.2 Staying the course

Zelnick's argument

"[Y]ou have to remain committed despite inevitable setbacks. Biographies of successful people often make challenges and privations seem, in retrospect, somehow romantic and also the harbingers of later success. At that time, they were neither" (p. 57). As the former Time Warner chief executive Dick Parsons put it, you have to "lash yourself to the deck" (p. 57).

Zelnick's example is his father-in-law, Sam Belzberg, a Canadian financier. After the real-estate crash of the early 1990s, Belzberg's companies suffered heavy losses, his brothers pushed him out of the family firm, and his net worth fell "some 95 percent"; at sixty-three he was "unemployed and very nearly broke", and seriously ill (p. 58). He sought further medical opinions and recovered, sold his house, raised a small sum from friends and began buying distressed real estate. "Within about ten years Sam had built a net worth that was more than double his prior peak" (p. 59).

Asked what went wrong, Belzberg says, "I was stupid." "He doesn't blame anyone else. He takes responsibility for taking his eye off the ball" (p. 59). And he learned: before the crash of 2008 "he was sufficiently liquid to weather a downturn" (p. 59). Zelnick's lesson: "it's always possible to fail if you stop paying attention and working hard. But it's also always

possible to succeed, even against pretty steep odds, if you relentlessly apply, in a targeted fashion, your talents and passions to an opportunity" (p. 60).

Notice two details. Belzberg did not simply try harder at the old plan: he changed the plan, starting smaller and on his own terms. And although "I was stupid" sounds like sweeping self-blame, what he changed was specific: in Zelnick's account he had taken his eye off the ball, so he kept enough cash to ride out the next crash.

What the research says: persistence helps, but it is not a trait you either have or lack

- **Grit is real but smaller than the headlines.** Grit — perseverance and passion for long-term goals — predicted outcomes such as West Point retention in the original studies (Duckworth et al., 2007). A meta-analysis later found a modest correlation with performance (about 0.18), a very large overlap with conscientiousness, and that the *perseverance* component carried most of the predictive value (Credé et al., 2017).
- **How you explain setbacks predicts whether you persist.** Insurance agents who explained failures as temporary and specific rather than permanent and pervasive sold more and were more likely to stay in the job (Seligman and Schulman, 1986). The lesson Zelnick draws from Belzberg — a specific lapse, taking his eye off the ball, with a specific fix — is that kind of explanation.

5.3 When to stop: perseverance versus escalation

Persistence has an evil twin. *Escalation of commitment* is the tendency to keep investing in a failing course of action because of what has already been invested. In the classic experiment, business students who had personally made a losing investment decision put more money into it than students who inherited the same decision (Staw, 1976). A later meta-analysis confirmed that sunk costs, personal responsibility for the original decision and the wish to avoid visible failure all push escalation up (Sleesman et al., 2012).

Daniel is exposed to all three. The team has spent $14,800 and about 2,300 hours on the motor; the Kestrel is his design; and he is its public face. None of those facts says whether option A is the better choice *now*. The questions that do are forward-looking: what will the next ten weeks cost, what are the chances of success, and what is gained if it works?

Engineering translation

Two engineering tools make a persist-or-stop decision practical.

- **Kill criteria, written first.** Before a test campaign or a career experiment, write the result that would make you stop, for example: "If the corrected motor fails either static fire, or is not flight-ready by 15 May, we fly the commercial motor." Criteria written in advance are harder to rationalise away later.
- **The pre-mortem.** Before committing, the team imagines that the project has already failed and each person writes down why (Klein, 2007). Imagining the failure as a fact, rather than a possibility, has been found to help people generate more reasons for an

outcome (Mitchell et al., 1989).

Figure 5.2 combines the sunk-cost test, kill criteria and Zelnick's two-year review into four checks to run after any serious setback.

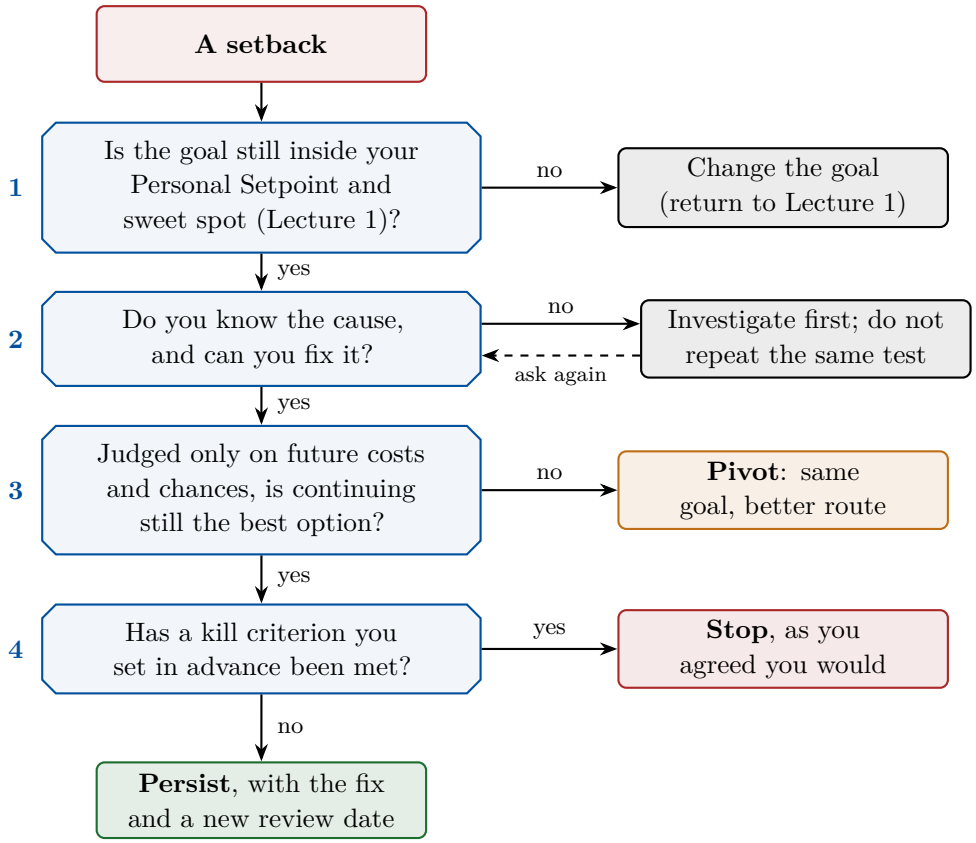


Figure 5.2: Persist, pivot or stop: a sequence of checks after a setback. The third gate removes sunk costs from the decision (Sleesman et al., 2012; Staw, 1976); the fourth applies kill criteria written before the setback, in the spirit of Zelnick's two-year test (p. 37).

2026 context: the long game in a tight entry-level market

Early careers in 2026 need patience. Statistics Canada reported youth (15–24) unemployment of 12.9% in August 2026, down from 14.3% a year earlier but still high (Statistics Canada, 2026), and Lecture 1 described how AI tools are changing some entry-level tasks. The author's reading for new engineers: a first search may take longer than older colleagues remember, so plan runway (savings and a fallback) as well as ambition. Daniel's uncle's offer is not the enemy of his ambition; it is part of his runway. Taking it would not end the long game; never applying to Aurora would end this round of it.

Capstone move

Run a fifteen-minute pre-mortem with your capstone team: "It is the day after the final demonstration, and it failed. Why?" Merge everyone's reasons and act on the top two this week.

Discussion questions

1. Zelnick estimates ten years from inception to "liquid success" (p. 56). Is there an equivalent for an engineering career? What does "liquid success" mean for an engineer?
2. Belzberg recovered by changing his plan, not by trying harder at the old one. Is that perseverance, or a pivot? Does the distinction matter?
3. Write one kill criterion for Daniel's option A. Who should agree to it, and when?
4. Give an example, from engineering or your own experience, of escalation of commitment. Which of the three drivers (sunk cost, personal responsibility, fear of visible failure) was strongest?

Assignment — Kill criteria and a pre-mortem (Two-Year Plan, Part 3)

Task.

1. Take the ambition and two-year test from Part 1. Add the longer view: what evidence would show you moving from apprentice to colleague (Figure 5.1), and roughly when?
2. For the riskiest milestone, write two kill or pivot criteria: observable results that would make you change route, and what you would do instead.
3. Run a pre-mortem on your plan with one other person: "It is two years from now and the plan failed. Why?" Record their reasons and yours, and revise your Part 1 two-year test as a result.
4. Name your runway: the savings, fallback and people that would carry you through a bad six months.
5. Write a one-paragraph summary of Parts 1–3.

Deliverable and due date. Two pages plus the summary, due at the end of week 3, bound with Parts 1–2 as your *Two-Year Plan*, as one PDF.

Marking (15 marks).

- *Longer view* (3): observable evidence of the move to colleague, with a rough date, consistent with Part 1 (3); observable but undated (2); vague (1); missing (0).
- *Kill criteria* (4): two observable criteria, each with an alternative (4); two criteria, only one with an alternative (3); one criterion (2); criteria that cannot be observed (1); missing (0).
- *Pre-mortem* (3): done with another person, with a change made as a result (3); done alone, or with no change (2); a list of risks only (1); missing (0).
- *Runway* (2): specific savings, fallback and people (2); partial (1); missing (0).
- *Summary* (3): consistent with Parts 1–3 and with your Personal Setpoint (3); consistent but generic (2); inconsistent (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Daniel what to choose; it shows which facts should drive each decision and which should not.

6.1 What the exhibits show

- **Exhibit 1 is a list without priorities.** Eighty recurring hours, a one-off hackathon, and zero hours for the single item most closely tied to his ambition. The list is honest; it just has not been ranked.

- **Exhibit 2 shows where a crisis takes its hours.** The failure review took eighteen extra hours: nine came from the capstone, CFD and the gym, and ten (the extra outreach hour included) from his thin slack and his sleep. The application got nothing: opening a form twice without writing is avoidance, not lack of time (Chapter 3).

- **Exhibit 3 is evidence of progress, then one failure with a known cause.** Tests 1–3 improved steadily, from a pressure shortfall to a stable burn at 94% of predicted impulse. Test 4 failed for a reason the draft review has found: an oversize O-ring groove and a seal not rechecked. That supports persisting with the *goal*. The $14,800 and 2,300 hours already spent do not bear on the choice at all (Chapter 5).

- **Exhibit 4 frames two options; there is a third.** The team could order the commercial motor now as insurance and continue the Kestrel fix under a kill criterion, flying whichever is ready. The $2,400 buys certainty of a flight; whether that is worth it is a real trade-off for the team to argue.

- **Exhibit 5 turns the failure into an asset.** Kiran's reply removes Daniel's stated reason for not applying and offers a review before the deadline.

- **The shrinking team is a signal, not a verdict.** Losing thirteen of thirty-four members since September says something about morale and workload. It says little about whether the motor design is sound, and nothing about the application.

6.2 A worked three-week plan

Table 6.1 shows one plan that respects Daniel's 168-hour week (Figure 4.2) and both deadlines.

Table 6.1: One three-week plan for Daniel, from the grid in Figure 4.1 and the checks in Figure 5.2.

Week	Ambition and priorities	Motor decision
18–24 January	Tell the hackathon friend; hand off social media; write the portfolio's burn-through story (5 hours).	Finish the failure review with the root cause and corrective actions.
25–31 January	Complete the portfolio draft (5 hours); send it to Kiran by 1 February.	Team meeting with a pre-mortem; agree options and kill criteria; decide by 1 February.
1–5 February	Revise from Kiran's comments; submit by Friday 5 February (5 hours).	Place the commercial-motor order if the team chose insurance; restart testing when the review is signed off.

6.3 One defensible sequence

1. **Apply.** Fifteen hours, a clear first step and an alumna willing to help. The most likely result is a rejection; not applying makes rejection certain, and is the choice he would most likely regret.

2. **Clear the "don't bother" quadrant** this week, and tell the people affected.

3. **Bring the team a decision with its reasoning**, as Dr Martel asked: a pre-mortem, the forward-looking costs of each option, and a written kill criterion for option A, for example "fly the commercial motor if either corrected static fire fails, or if the motor is not flight-ready by 15 May".

4. **Keep the uncle's offer warm, honestly.** Thank him, ask whether a decision can wait until he hears from Aurora, and treat the offer as runway, not defeat.

5. **Write the two-year test** for the ambition itself: what progress towards designing launch-vehicle engines should look like by 2029, whichever job he takes in June.

> **The one-sentence version of this lecture.** Say what you want and take the first step even though you may fail, spend your hours on the few things that matter most, and persist on the goal while staying free to change the route — using criteria you wrote before the setback, not after it.

Glossary

Approach and avoidance goals Goals framed as achieving success versus avoiding failure; combined with mastery or performance standards they give four goal types (Elliot and McGregor, 2001).

Attention residue Continued thinking about a previous, unfinished task that lowers performance on the next one (Leroy, 2009).

Career stages Dalton and Thompson's apprentice, colleague, mentor and sponsor stages for professionals (Morse et al., 2020, p. 367).

Deliberate practice Effortful practice designed to improve performance, with feedback (Ericsson et al., 1993).

Escalation of commitment Continuing to invest in a failing course of action because of past investment or personal responsibility for it (Sleesman et al., 2012; Staw, 1976).

Explanatory style The habitual way a person explains setbacks: temporary, specific and external, or permanent, pervasive and personal (Seligman and Schulman, 1986).

Goal shielding The suppression of competing goals while one goal is active (Shah et al., 2002).

Grit Perseverance and passion for long-term goals (Duckworth et al., 2007).

Impact–difficulty grid Zelnick's four-quadrant tool for ordering goals by impact and difficulty (pp. 39–40).

Kill criterion An observable result, agreed in advance, that ends or redirects a project.

Liquid success Zelnick's term for success that has become cash in the bank (p. 56).

Personal Setpoint The written values, goals and sweet spot from Lecture 1.

Phase-gate review A project review at a set point, against criteria agreed in advance.

Planning fallacy The tendency to underestimate how long one's own tasks will take (Buehler et al., 1994).

Pre-mortem Imagining that a project has already failed and listing the reasons, before committing to it (Klein, 2007).

Reference-class forecasting Estimating a project from the actual outcomes of similar past projects (Flyvbjerg, 2006).

Runway The savings, fallbacks and support that carry you through a bad period.

Self-efficacy Confidence that you can perform a specific task (Stajkovic and Luthans, 1998).

Self-handicapping Creating an obstacle to your own performance so that failure can be blamed on it (Berglas and Jones, 1978).

Sunk cost A cost already incurred and unrecoverable; it should not affect a new decision.

Sweet spot The intersection of talent, passion and opportunity, inside your values (Lecture 1; Zelnick, pp. 29–33).

Switch cost The loss of time and accuracy when changing between tasks (Rubinstein et al., 2001).

Two-year test Zelnick's practice of committing to an ambition for a fixed period, then assessing progress and changing course if necessary (p. 37).

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 1 and turns the Personal Setpoint into action. Its job is to make three uncomfortable things discussable: ambition people hide, commitments they will not drop, and projects they cannot stop. The case is set in mid-January, which suits the start of a winter term. Materials: sticky notes for the grid exercise, and a printed blank copy of Figure 4.1.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Three hand votes: apply or not; option A or B; what to drop. Record the splits.
10–25	Ambition	Ask who voted "don't apply" for a reason other than time. Introduce Figure 3.1; ask which cell Daniel is in. Show Figure 3.2.
25–45	Priorities	In pairs, students place Daniel's commitments on the grid with sticky notes, then compare with Table 4.1. Discuss Zelnick's ordering (quadrant 2 before 3).
45–65	Persist or pivot	Walk Figure 5.2 for option A. Ask for a kill criterion; then run a three-minute class pre-mortem on option A.
65–80	Close	Debrief Chapter 6, including the third option (8 minutes); re-vote and ask who changed their vote and why (4 minutes); assign Part 1 of the Two-Year Plan (3 minutes).

Sections 3.3 ("What do you really want?") and 3.5 (mortality and regret) are reading-only; refer to them in the 10–25 segment if time is short.

Talking points for every discussion question

Case (Chapter 2)

Q1: fear of visible rejection (performance-avoidance) and a story about grades that the alumna contradicts. Q2: the hackathon and CFD self-study; social media can be handed off. Q3: the root cause and the improving trend in tests 1–3 matter; the sunk $14,800 should not. Q4: a morale and workload signal; it does not test the design. Q5: good answers name observable outcomes (an application submitted, a motor flown, a root cause fixed) rather than feelings.

Chapter 3

Q1: private goals are often framed as avoidance. Q2: goals where partial pursuit burns a bridge or a safety margin (for example, a risky test campaign without controls). Q3: rarely; it trades a better chance for a better excuse. Q4: look for evidence that is observable at each date (customers, revenue, a prototype), not effort.

Chapter 4

Q1: right for turnarounds and team morale (quick wins buy credibility); a trap for individuals

with deep work to do. Q2: accept any three that match the student's setpoint; push back on four or more. Q3: score impact per value, or treat some items as constraints (income) rather than goals. Q4: meetings and unclear communication, both in LeBoeuf's top five, often come up.

Chapter 5

Q1: for engineers, "liquid" success might mean licensure, recognised expertise or financial security; the timescale is similar. Q2: a pivot on the route with persistence on the goal; the distinction matters because it separates stubbornness from commitment. Q3: an observable test result or date, agreed by the team and adviser before testing restarts. Q4: common examples include debugging a doomed approach and retaining a failing supplier.

Marking guidance

A strong Part 1 names an ambition the student finds slightly uncomfortable to say and shows a first step actually taken. A strong Part 2 shows the time log changing the student's view of their week. A strong Part 3 contains a kill criterion the student would genuinely act on. Reward honesty over polish throughout; students may summarise private matters.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. The impact–difficulty grid (p. 40) was built for running companies; for an individual's week it works best alongside a time budget, which is how the lecture uses it.
2. The 10,000-hour figure (p. 57) is best taught as "mastery takes years of deliberate work", which is his point, rather than as an exact threshold.
3. The Belzberg story (pp. 57–60) shows what persistence looks like from the inside. Pair it with the lecture's kill criteria so that students learn both halves: when to keep going and how to decide in advance when to stop.
4. The Henry Ford line (p. 38) is widely attributed to Ford and is used here, as Zelnick uses it, as a prompt to try. A few dates in his AOL account (p. 56) differ slightly from other sources; the lesson about how long success takes is unaffected and is supported by research on founders' ages (Azoulay et al., 2020).

None undermines his argument, and spotting them models the habit of checking sources.

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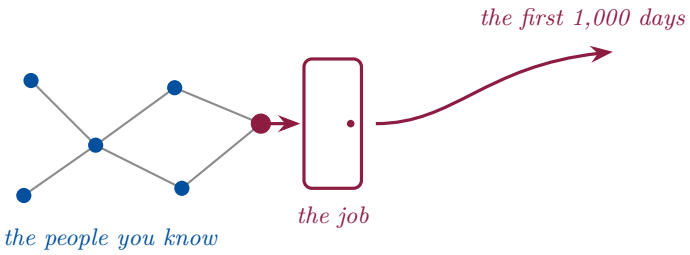
Success as an Engineer — Professional Practice Series

Lecture 3

The First 1,000 Days

Landing the job you want and starting well

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	Ninety Days at Halden (software / medical devices)
Year:	2026



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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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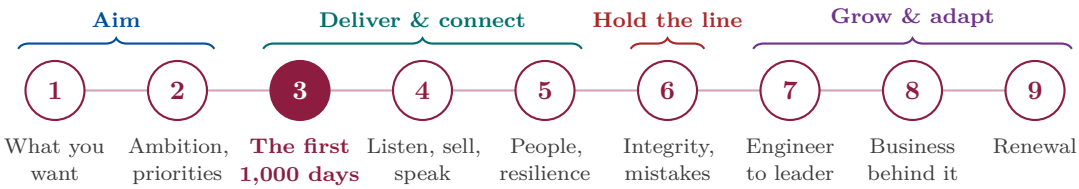
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Chapter 1

About This Lecture



Lectures 1 and 2 were about aim: what you want, and how you will pursue it. This lecture is about the first contact with reality. You have to find the job, and then, in roughly your first 1,000 days, turn a new hire into an engineer whom people trust with real work. Both steps reward habits that are easy to learn and easy to neglect.

Learning objectives

By the end of this lecture you will be able to:

- **Run** a job search that uses your network, homework and follow-up, not only online applications, and explain what the research on weak ties and job-search effort says about why.
- **Prepare** for structured interviews and for the job-posting rules that took effect in Ontario in 2026.
- **Start** a new job as "leadership material": visible, responsive and reliable, without mistaking long hours for performance.
- **Manage** the relationship with your manager: no surprises, and completed staff work.
- **Plan** your learning for the apprentice stage, and judge which popular claims about workplace learning are evidence-based.
- **Produce** your *Launch Plan*: three short parts, built across the chapter assignments, that carry your Two-Year Plan into a search and a first year.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument. Its chapter "How to Find the Job You Want" is a practical search method; "The Three Rules" says what to do once you are hired; and "You're Never Too Busy to Be Responsive" explains, with an expensive story, why returning calls matters.

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: its advice on "getting off to the right start" regarding your work, your manager and people outside your team, and its warning about technical obsolescence.

Peer-reviewed research tests both, and in places corrects them.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Launch Plan

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would advise Sofia before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Launch Plan**: Part 1 (a search plan, due at the end of week 1), Part 2 (a first-90-days plan, due at the end of week 2) and Part 3 (a manager and learning plan, due at the end of week 3). It draws on your Two-Year Plan from Lecture 2.

Chapter 2

Case Study: Ninety Days at Halden

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Monday 29 November 2027, 7:05 a.m.

Sofia Moreau sat in the parking lot of Halden Medical Systems in Kitchener, twenty-five minutes before her usual arrival time, rereading her notes from Friday's 90-day check-in. Most of it had been good. Some of it had stung. And her manager had ended with an offer she did not know whether she was ready to accept.

Three months earlier she had joined Halden's infusion-pump software team as a Software Engineer I, seven months after she started looking for work. The search had not gone the way she expected.

2.2 Part A: the search

Sofia graduated in software engineering in April 2027 with a strong capstone — a scheduling service for a hospital clinic — and two co-op terms. She began applying on 1 February. For the first six weeks she did what most of her classmates did: she applied online, at night, to every posting that matched her keywords. In mid-March, discouraged, she followed a suggestion from her capstone supervisor and changed her method. She kept a tracker (Exhibit 1).

Exhibit 1 — Sofia's search tracker, 1 February to 14 May 2027

Channel	Contacts	Hours	First interviews	Final interviews	Offers
Online applications to postings	64	70	3	1	0
Career fair and agency recruiters	9	12	2	1	0
Informational meetings (alumni, capstone sponsor, former co-op manager)	11	30	5	3	1
Total	**84**	**112**	**10**	**5**	**1**

All five first interviews from informational meetings came through a referral by the person she had met. The offer came from Halden, where an alumna she had met for coffee passed her résumé to the hiring manager.

Her capstone supervisor had also marked up her résumé and her standard cover email (Exhibit 2).

Exhibit 2 — Résumé line, research and email closing, before and after

	Before	After
Résumé line	"Worked on backend for capstone project using Python."	"Built the scheduling service for a clinic's 14 exam rooms; cut average patient wait in the pilot from 38 to 24 minutes; 92% unit-test coverage."
Email closing	"I look forward to hearing from you."	"I will call your office on Tuesday to ask for twenty minutes at your convenience."
Research	None	Three sentences on Halden's newest pump and its 2026 software recall notice, and why that made her want to work on verification.

2.3 Part B: the first ninety days

Sofia started at Halden on Monday 30 August 2027. The pump software was classified as safety class C under IEC 62304, the international standard for medical-device software life cycles, so every change needed a traceable requirement, a review and a verification record. Her manager, Arjun Nair, gave her a written onboarding plan (Exhibit 3).

Exhibit 3 — Onboarding plan from Arjun Nair, 30 August 2027

Days 1–30	Learn the pump architecture, the IEC 62304 process and our tools. Pair with Mei on two bug fixes. Meet the QA lead, the test-lab supervisor and one systems engineer.
Days 31–60	Own three small defects end to end, including the verification record. Walk the team through one of them at a Thursday design review.
Days 61–90	Take one test-infrastructure improvement from proposal to merge. Tell me what you would change about how we onboard people.

"Ask questions early. I would rather answer ten questions in week one than find one surprise in week ten." — A.N.

Sofia worked hard. Wanting to make an impression, she arrived at 7:30 every morning and rarely left before 7:30 in the evening. To protect her concentration, she answered messages in one batch on Friday afternoons. In week 6 she logged her time and her inbox for a course she was taking on professional practice (Exhibit 4).

Exhibit 4 — Sofia's week 6, 4–8 October 2027

Item	Value	Note
Hours at work (Monday–Friday)	58	Plus about 6 hours at home on Saturday
Messages received from QA and the test lab	41	Mostly questions about her defect fixes
Median time to reply	26 hours	Replies batched on Friday afternoon
Messages unanswered after three days	5	Two from the QA lead
Design reviews attended / spoke at	2 / 0	"I didn't want to say something wrong"
Unplanned work	1	Fixed a flaky test harness over the weekend; told no one

The harness fix was good work: it removed a timing fault that had failed about one nightly build in five for months. Arjun noticed on the build dashboard that the builds had stayed green for a week, then read the commit history to find out why.

2.4 Friday 26 November: the check-in

Arjun's notes from the 90-day check-in are in Exhibit 5.

Exhibit 5 — Arjun Nair's 90-day check-in notes (shared with Sofia)

Going well. Excellent code quality. The harness fix saves the team hours every week. Your defect write-ups are the clearest on the team.

To change. (1) The QA lead says you are hard to reach; in a class C project, a three-day silence can hold up a release. (2) I learned about the harness fix from the build dashboard. Tell me — I need to know what you are doing, and I want to give you credit. (3) You are here until 7:30 every night. I don't need that; I need predictability and good judgement. (4) Apart from your one walk-through, you have said nothing in eight design reviews. You see things others miss. Say them.

Offer. Lead the migration of our 1,800 unit tests to the new test framework, with two engineers from the test lab, by the end of March. It is visible across three teams. Think about it over the weekend.

Sofia felt behind: she worked longer than anyone on her team, and had just been told that this was not what her manager wanted.

Discussion questions

Before reading further, write a short answer to each question.

1. Compare the channels in Exhibit 1 by interviews and offers per hour. Why do they differ?
2. Which change in Exhibit 2 would matter most to a hiring manager, and why?
3. Sofia batched replies to protect her concentration. What did it cost? Was the idea wrong?
4. Why might Arjun be unimpressed by her 58-hour weeks?
5. Should Sofia accept the migration? What should she change first?

We return to Sofia in Chapter 6.

Chapter 3

Finding the Job You Want

3.1 Zelnick's search method

Zelnick's argument

Once your values and goals are clear, "you ought to have a pretty good sense of the kind of job you want" (p. 41). First, a résumé: "Emphasize your achievements: try to connect your performance to measurable results" (p. 41). Then get it to the three groups who can help: "recruiters . . . ; human resources professionals at specific companies where you might want to work; and, perhaps most importantly, executives, who often hire people they've met through introductions or even cold calls" (p. 41). "Finding the job you want is often accomplished through initiating and building relationships with people who fall into one or more of those categories" (p. 41).

Zelnick then lists tactics. Four of them carry most of the weight for an engineer.

- **Tailor, and do your homework.** Form emails are "obviously cut-and-paste versions of previous inquiries"; take the time to write one "specifically designed for its recipient" (p. 42). Read the annual report, the strategy and the management team: "Doing your homework matters more than your fancy education" (p. 42). "The degree may get you a look, but knowing something about the organization will make an impression" (p. 43).

- **Don't wait to be chosen.** Never end with "I look forward to hearing from you": "You shouldn't look forward to that — because it *won't happen*. No stranger is going to pluck you out of the pack; you have to find your own route in." Instead: "I will follow up with you next week to arrange a meeting at your convenience." Then do so (p. 43).

- **Use every connection.** "If you have any connection at all, no matter how tenuous, to someone who works in your area of interest, reach out to him or her and ask for an informational meeting" (p. 44). Ask the career office for alumni in your field and contact all of them.

- **Treat every meeting as a sales call.** "An interview, even if it's informational, is a sales call: and the product is you. So listen more than you talk" (p. 44). Before leaving, ask two questions: "Are there any opportunities here?" and "Is there anyone else you would suggest I meet?" (p. 44).

His own first job in entertainment came this way. Through a former internship contact, Brian McGrath, then head of international television at Columbia, he had an informational meeting, asked if he could return, and was later told that a possible opening was not right for him. He did not argue; he asked to come back. "I met with Brian every six weeks or so until, finally, he offered me the job. (It wasn't that I'd become a stronger candidate; rather, I had developed a

relationship with Brian — and no one more qualified had come along in the meantime.)" (pp. 45–46). Even a failed interview helps: write to thank the interviewer, because "the people you met in the process are now part of your ongoing network" (p. 45).

What the research says: the network effect is real, and weak ties matter

- **Acquaintances carry new information.** Granovetter (1973) argued that acquaintances ("weak ties") connect you to circles that you and your close friends do not reach, and so carry news of jobs you would not otherwise hear about.
- **The largest test agrees, with a twist.** Randomised experiments on LinkedIn's "People You May Know" feature, covering about 20 million people over five years, found that weaker ties produced more job mobility than strong ones. The relationship was an inverted U: measured by mutual connections, moderately weak ties helped most (Rajkumar et al., 2022). An alumna you met once for coffee is exactly that kind of tie.
- **Networking pays over years.** In a longitudinal study, professionals who networked more had faster salary growth and higher career satisfaction (Wolff and Moser, 2009).
- **Effort matters, and so does its form.** A meta-analysis found that job-search behaviour predicted finding employment (Kanfer et al., 2001). Exhibit 1 suggests the next step: effort through people converted far better than effort through postings.

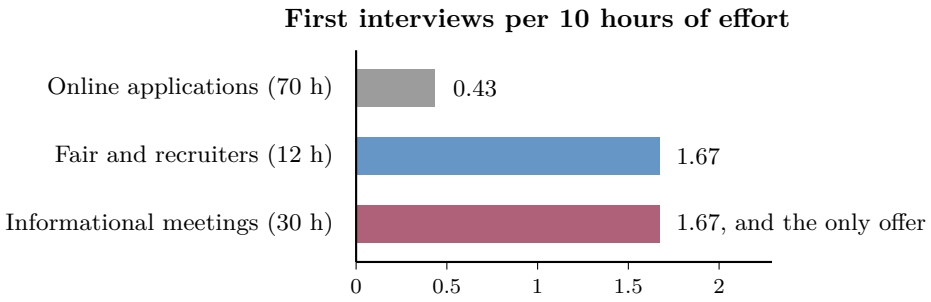


Figure 3.1: Sofia's search from Exhibit 1, per 10 hours of effort. The recruiter channel matched informational meetings on first interviews per hour but produced no offer; every first interview from informational meetings came with a referral. One person's search is an anecdote, not evidence; the research above is the evidence.

Myth check: "70 to 80% of jobs are never advertised"

This figure appears in countless career guides, usually as "the hidden job market". No traceable study supports it; it is repeated from guide to guide without a source. What the evidence does support is more modest and more useful: referrals and weak ties shape who hears about openings and who is considered (Granovetter, 1973; Rajkumar et al., 2022). Apply to postings *and* use your network; do not skip postings because of a statistic no one can source.

3.2 Interviews, and what the evidence says about them

Zelnick's advice to "listen more than you talk" and to ask about the other person (p. 44) applies to informational meetings. Formal interviews for engineering roles are increasingly *structured*:

every candidate gets the same job-related questions, scored against the same rubric. Structured interviews are among the best predictors of job performance that employers can use (Sackett et al., 2022), so well-run employers will keep using them.

Engineering translation

Prepare for a structured interview the way you prepare for a design review: know the requirements (the posting and the competencies behind it), assemble evidence, and rehearse. For each likely question ("Tell me about a time you found a defect others missed"), prepare a short account with the situation, what *you* did, and a measurable result — the same shape as the "after" résumé line in Exhibit 2. Zelnick's homework rule makes the difference in the last five minutes, when you are asked what questions you have.

2026 context: new job-posting rules and AI screening

Since 1 January 2026, Ontario employers with 25 or more employees must, in publicly advertised job postings, state the expected pay or a pay range (with limits on how wide the range can be), disclose whether artificial intelligence is used to screen, assess or select applicants, say whether the posting is for an existing vacancy, and avoid requiring Canadian experience. They must also tell interviewed applicants, within 45 days of the last interview, whether a hiring decision has been made (Ontario, 2026). Two consequences for your search: the pay range is now data you can use, and a posting that discloses AI screening is a reason to make sure the wording of your résumé matches the posting honestly — and a further reason to find a person, not only a portal.

Capstone move

Ask your capstone sponsor or supervisor for a twenty-minute conversation about their own career, and end it with Zelnick's two questions. Then send a thank-you note within twenty-four hours.

Discussion questions

1. Zelnick met Brian McGrath "every six weeks or so" until he was hired (pp. 45–46). Where is the line between persistence and pestering? How would you know you had crossed it?
2. Why might weak ties carry more job information than close friends? When would a strong tie be more useful?
3. Is networking fair to graduates without family connections in engineering? What in Zelnick's method does not depend on who you already know?
4. How should AI screening change the way you write a résumé, if at all? Where is the line between matching a posting and misrepresenting yourself?

Assignment — Your search plan (Launch Plan, Part 1)

Task.

1. List ten target organisations that fit the sweet spot in your Personal Setpoint (Lecture 1). For each, write two lines of homework: what they make, and one recent development.
2. Rewrite three résumé lines so that each connects your work to a measurable result.
3. Identify ten weak ties (alumni, former co-op colleagues, sponsors, people quoted in trade press) and send at least three requests for an informational meeting, each tailored and each ending with a follow-up commitment.
4. Write down the answers to two structured-interview questions of your choice, each with situation, action and measurable result.

Deliverable and due date. Two pages (PDF), with copies of the three requests, due at the end of week 1.

Marking (10 marks).

- *Targets and homework* (3): ten targets with specific homework (3); homework generic or fewer than ten (2); list only (1); missing (0).
- *Résumé lines* (2): all three measurable and honest (2); some measurable (1); missing (0).
- *Requests* (3): three tailored requests with a follow-up commitment (3); tailored but no follow-up (2); generic (1); missing (0).
- *Interview answers* (2): both with situation, action and a measurable result (2); one, or results vague (1); missing (0).

Chapter 4

Starting Well

4.1 Leadership material from day one

Zelnick's argument

"Once you land the job you want, you should be regarded by others as leadership material and view yourself (and behave) as the leader you hope to become" (p. 47). As a student and later in business school, Zelnick asked successful executives he met the same question — "what's your key to success?" — and found that the answers "generally fell into three specific categories" (p. 47): *listen*; *get to work early*; and *never compromise your integrity, because it's all you have* (pp. 47–55).

Lecture 4 takes up listening and Lecture 6 integrity. This chapter takes the middle rule, and two habits that go with it in Zelnick's book: responsiveness and visibility. Morse, Schell & Babcock open their own advice for new engineers with a passage from the French engineer and executive Henri Fayol, written in 1916: "You will be judged not on what you know but on what you do and the engineer accomplishes but little without other people's assistance, even when [they] start out" (Morse et al., 2020, p. 362).

What Morse, Schell & Babcock add: regarding your work

"The new graduate makes their mark within the first few years in the organization," so give your best effort to early assignments "regardless of how trivial they may appear": "Doing an exceptional job on a minor assignment is the best way to be recognized as a reliable contributor and assigned more important … work" (Morse et al., 2020, p. 362). Morse, Schell & Babcock add: do not wait for others — keep a follow-up list and chase what you need, "understanding, but persistent" — and learn the corporate culture by watching how effective colleagues get things done (Morse et al., 2020, pp. 363–364).

What the research says: how newcomers adjust

- **Three things predict a good start.** A meta-analysis of newcomer socialisation found that newcomers who gain *role clarity*, *self-efficacy* and *social acceptance* perform better, are more satisfied and committed, and are less likely to leave (Bauer et al., 2007). Organisations help, but newcomers' own information-seeking helps too.
- **Asking for feedback helps, modestly.** A meta-analysis of thirty years of research found that seeking feedback is positively but weakly related to performance, and is also related to newcomers' adjustment (Anseel et al., 2015).

Sofia's onboarding plan (Exhibit 3) was built for all three: meet the QA lead (acceptance),

own small defects end to end (clarity and self-efficacy), and "ask questions early".

4.2 Get to work early — and what long hours buy

Zelnick's argument

Zelnick learned the second rule from Leonard Polaner, chief executive of a jam and pickle company: "Get to work fifteen minutes earlier than your boss and leave fifteen minutes later." Zelnick admits "mixed feelings about this because it seems a little disingenuous when put that way" (p. 51). His defence: early in a career, "there's little to differentiate you from others. ... What can differentiate you, though, is a demonstrated commitment and a willingness to work harder than others. When you have some successes under your belt you can add more balance to your life. In the beginning, though, there's just no substitute for hard work — and long hours" (pp. 51–52).

Morse, Schell & Babcock say something similar under the heading "Go the Extra Mile — and Hour": "Only in the rare organization is a reputation made in a 40-hour week"; they then add that this "must be balanced against our other values" and that "success in most organizations is measured in effectiveness, not just hours" (Morse et al., 2020, p. 363). The evidence explains why both halves are true.

What the research says: being seen helps; very long hours do not

- **Being seen shapes how you are judged.** Managers who simply saw employees at work during normal hours judged them more "dependable"; those seen arriving early or staying late were judged more "committed" — without the managers being aware of the inference (Elsbach et al., 2010). Zelnick's rule works partly for this reason.
- **Each extra hour adds less.** In records of munitions workers, output rose in proportion to hours up to about 49 hours a week, then more slowly; output at 70 hours was hardly higher than at 56 (Pencavel, 2015).
- **Very long hours harm health.** The WHO and ILO estimated that working 55 or more hours a week caused about 745,000 deaths from stroke and heart disease worldwide in 2016 (Pega et al., 2021); the underlying reviews found about a 35% higher risk of stroke and a 17% higher risk of dying from heart disease than for 35–40-hour weeks (Descatha et al., 2020; Li et al., 2020).

Myth check: "The engineer who works the longest hours gets the most done"

For short bursts — a launch, a line-down fault — extra hours help. Sustained, they buy less and less output while fatigue can raise error rates and health risk, and in knowledge work the lost quality is often invisible until later. Zelnick's own advice points to what matters: *demonstrated commitment*. Arriving before a meeting prepared, being predictable, and finishing what you start demonstrate it better than a sixty-hour week.

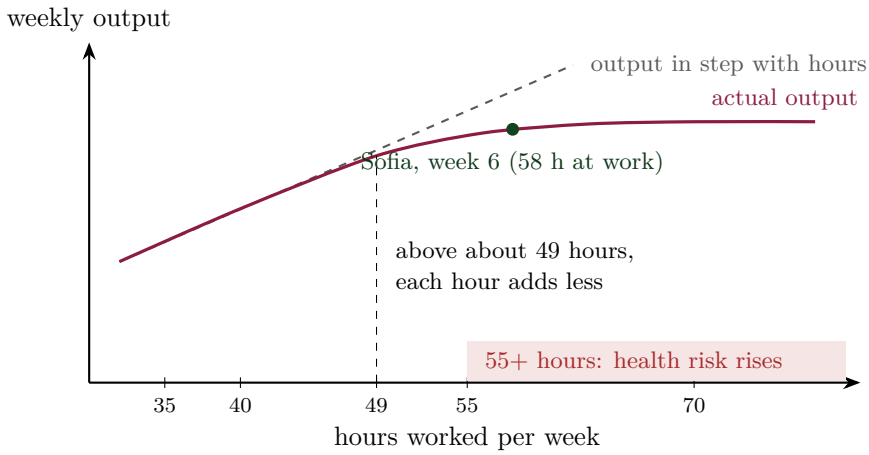


Figure 4.1: Hours and output, drawn schematically after Pencavel (2015) (munitions work, not engineering; the shape, not the numbers, is the point) with the WHO/ILO threshold for long hours (Pega et al., 2021). Sofia's 58-hour week bought little extra output and a real cost.

Engineering translation

Read the rule as "be reliably early, not endlessly late". Arrive early enough to be ready before the first meeting; keep your hours predictable so that people know when they can reach you; protect two or three blocks of deep work a week; and save long days for the times the team genuinely needs them. That is the predictability Arjun asked for in Exhibit 5.

Capstone move

Agree with your capstone team the hours when you can be reached, and protect one two-hour deep-work block this week. Then tell your supervisor about one piece of work you finished that they may not know about, in two sentences.

4.3 Never too busy to be responsive

Zelnick's argument

"I learned from Barry Diller to return telephone calls the same day they are received (and I now apply that lesson to e-mail)" (p. 85). The reasons: "First, because it's just plain polite. Second, because you never know where interesting ideas will come from. Third, because it's how we'd all like to be treated" (p. 85). When Zelnick later started ZelnickMedia with no capital, at almost every meeting "someone in the room would say to me 'You may not remember, but you were willing to meet with me early in my career, and you were really helpful to me' " (p. 86).

The cautionary tale: a young man fresh out of law school, whom he calls Bobby, visited "every six months or so" for advice (p. 87). Busy and stressed in early 1999, Zelnick stopped returning his calls. In 2000 Bobby, by then a co-founder of a technology company that had gone public, told him why he had called: he had wanted to offer Zelnick founder's stock, worth "about $25 million" at the initial public offering. "I'm very good about promptly returning calls and e-mails now" (pp. 86–88).

Sofia's weekly batch was not laziness; it was an attempt to protect concentration, and the research partly supports her.

What the research says: batch, but on a short cycle

- **Constant checking costs.** People who were interrupted compensated by working faster, but at the price of more stress, frustration and effort (Mark et al., 2008). When people were told to check email only three times a day for a week, they reported less stress than when checking as often as they liked (Kushlev and Dunn, 2015).
- **Helping is double-edged.** In a study of engineers at a telecommunications firm, those who gave more help than they received gained status among colleagues (Flynn, 2003). Grant (2013), drawing on this and other work, argues that the most generous people are found at both the bottom and the top of performance, and that helping pays when it comes with boundaries on one's own time.

For Sofia: batch several times a day, not once a week, and acknowledge blocking requests the same day.

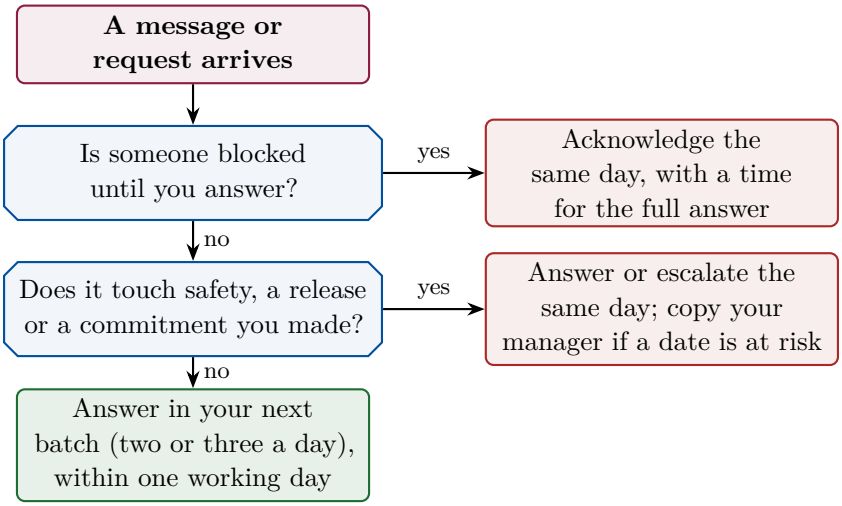


Figure 4.2: A responsiveness protocol that keeps Zelnick's same-day rule for what matters (p. 85) while protecting concentration (Kushlev and Dunn, 2015). The thresholds are this lecture's suggestion; agree yours with your team.

4.4 Be seen, and speak up

Morse, Schell & Babcock are blunt: "You can do a good job every day, but you need to be seen to be recognized as a 'rising star' … Learning the dividing line between making your capabilities visible and being overly self-promoting takes maturity" (Morse et al., 2020, p. 363). Sofia's harness fix was excellent work nobody saw, and her silence in reviews hid her judgement.

What the research says: why newcomers stay silent, and what helps

- **Silence is common.** Employees often withhold ideas and concerns for fear of looking incompetent or harming relationships, especially when they have less status (Morrison, 2014).
- **Teams differ.** Where it feels safe to take interpersonal risks ("psychological safety"), teams discuss errors and learn more (Edmondson, 1999). Arjun's notes signal such a team.

Engineering translation

Speaking up in a design review is a skill, not a personality trait. Read the pre-read; prepare one observation; lead with the evidence ("the timing log shows…"); and frame it as a question when you are unsure ("have we checked what happens if the sensor drops out?"). One prepared sentence per review builds the habit, and the reputation, within a term.

Discussion questions

1. Zelnick says his fifteen-minutes rule "seems a little disingenuous" (p. 51). Is being seen to work hard honest? Does the answer change for remote work?
2. Test Figure 4.2 against a week of your own messages. Where does it fail?
3. Morse, Schell & Babcock warn about being "overly self-promoting" (Morse et al., 2020, p. 363). How would you tell your manager about the harness fix without sounding like it?
4. Should a new graduate ever work 55-hour weeks? When, and for how long?

Assignment — Your first ninety days (Launch Plan, Part 2)

Task.

1. Write a 30–60–90-day plan for your first job or next co-op, modelled on Exhibit 3: what you will learn, own and deliver, and whom you will meet.
2. Write your responsiveness protocol, adapting Figure 4.2, with your batch times and the cases that get a same-day answer.
3. Describe your working pattern (arrival, core hours, deep-work blocks, when you would work long days) and justify it with this chapter's evidence.
4. Write two sentences telling a manager about unseen work, such as Sofia's harness fix.

Deliverable and due date. Two pages (PDF), due at the end of week 2.

Marking (15 marks).

- *90-day plan* (5): specific learning, ownership and people in all three periods (5); all three periods, one of them generic (4); two periods specific (3); one period specific (2); generic throughout (1); missing (0).
- *Protocol* (4): clear triggers and times that protect deep work and keep blocking requests to a day (4); clear, with one gap (3); workable but vague (2); a statement of intent only (1); missing (0).
- *Working pattern* (4): predictable, evidence-based and honest about trade-offs (4); predictable and partly justified (3); reasonable but not justified (2); unrealistic (1); missing (0).
- *Visibility sentences* (2): factual, specific and credit-sharing (2); boastful or vague (1); missing (0).

Chapter 5

Becoming Trusted: Your Manager and Your Learning

5.1 Managing the relationship with your manager

Zelnick's first rule of the new job — behave as the leader you hope to become (p. 47) — starts with the person you report to. Morse, Schell & Babcock give practical advice on that relationship.

What Morse, Schell & Babcock add: regarding your manager

- **Choose your manager carefully.** Quoting King, Morse, Schell & Babcock call the choice "second in importance only to the selection of proper parents": you learn the craft by watching a master (Morse et al., 2020, p. 364).
- **Keep your manager informed.** Ask, "What does my manager need to know to do their job effectively?" Above all, "never let your manager be caught by surprise." If a job is not worth doing, say so and agree before dropping it (Morse et al., 2020, p. 364).
- **Make your manager's job easy.** "Learn to do completed staff work: Do not just go to your manager with a problem — state the problem, the alternatives you have considered, and your recommended action" (Morse et al., 2020, p. 364).

They add a caution that cuts the other way: "More new professionals err by communicating too much than by communicating too little" (Morse et al., 2020, p. 364). Sofia shows that the opposite error is also common.

What the research says: the quality of the relationship matters

Across a large meta-analysis, the quality of the relationship between employees and their managers — "leader–member exchange" — was associated with higher performance, satisfaction and commitment, and with lower intention to leave (Dulebohn et al., 2012). The relationship is built from both sides, and a new engineer's reliability and communication are among the few levers entirely in their own hands.

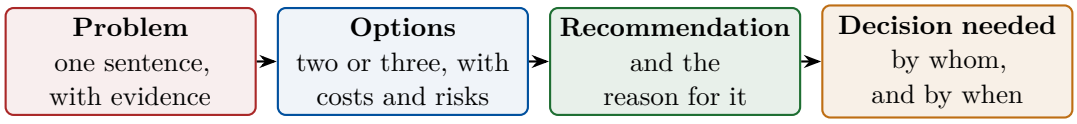


Figure 5.1: Completed staff work: the problem, alternatives and recommendation that Morse, Schell & Babcock recommend (2020, p. 364), extended here with the decision needed. Applied to Exhibit 4, Sofia's harness fix would have been a two-line message: the fault, the fix, the result, and "no decision needed — for your information".

5.2 Staying technically competent

What Morse, Schell & Babcock add: the threat of obsolescence

Morse, Schell & Babcock, quoting Shannon, define technical obsolescence as no longer being familiar with, or able to apply, "the knowledge, methods, and techniques that are generally considered important" in one's profession, and insist that "individual engineers cannot and should not depend on their employer to combat obsolescence" (Morse et al., 2020, pp. 374–375). The most important vehicle, they report, "is personal growth on the job itself": in one survey of 290 professionals, 42% named on-the-job problem solving and 20% interaction with colleagues as most important for their growth, against 14% for formal coursework. Where an employer offers no growth, "the engineer must find them, even if in another organization" (Morse et al., 2020, p. 375).

Zelnick's own career makes the same point from the other side. He moved from television to films to video games to music: "I knew nothing about television when I landed a job at Columbia Pictures. ... People recruit talented individuals and many companies like to hire out of the box" (p. 43). What travelled with him was not domain knowledge but the ability to learn a new domain quickly.

Myth check: "70% of learning comes from experience, 20% from others and 10% from courses"

The "70–20–10" rule is repeated in many training departments as if it were a finding. It began as a rough summary of executives' own reports of what had developed them, and reviews have found little rigorous evidence for the ratio (Johnson et al., 2018). The direction is sensible — challenging work and good colleagues matter more than courses — and Morse, Schell & Babcock's survey agrees. The numbers are not a law, and they are no reason to skip formal learning when a job needs it.

What the research says: what makes learning at work effective

- **Practice alone is not enough in professional work.** Deliberate practice explained less than 1% of the variance in performance in professions, compared with about a fifth in music and sports (Macnamara et al., 2014). Professional skill grows from varied, challenging assignments with feedback, not repetition.
- **Newcomers who seek feedback adjust better** (Anseel et al., 2015), and newcomers

who get role clarity and social acceptance adjust better (Bauer et al., 2007). Early learning is social as well as technical.

5.3 The apprentice stage, and licensure

In Dalton and Thompson's model, which Lecture 2 introduced, the new professional is an *apprentice* who is willing to do routine work "yet aggressively searches out new and more challenging tasks" (Morse et al., 2020, p. 367). The first 1,000 days — roughly three years — are the apprentice stage for most engineers, and in Ontario they are also the years in which you build the experience record for your P.Eng.: Professional Engineers Ontario now requires a minimum of two years, though applicants need three to four years on average to show all the required competencies (PEO, 2026).

Table 5.1: A learning plan for the first 1,000 days, built on Morse, Schell & Babcock's sources of growth (2020, p. 375). Times are one reasonable allocation, not a rule.

Source	What it looks like in the first three years	Typical time
Stretch assignments	Ask for one piece of work each quarter that you do not yet know how to do, such as Sofia's migration project	Part of the job
Colleagues	A regular session with a senior engineer; code and design reviews given and received	1–2 hours a week
Reading	Standards, application notes, incident reports in your domain (IEC 62304 for Sofia)	1–2 hours a week
Formal learning	One course or certificate a year where the job needs it; graduate courses if your goals call for them	A term at a time
Licensure	Record experience against the competencies from day one; write the professional practice exam in year one	A log kept monthly

Capstone move

Send your capstone supervisor one piece of completed staff work this week: a real problem on your project, two or three options, your recommendation and the decision you need.

Discussion questions

1. Morse, Schell & Babcock say new professionals more often communicate too much than too little (Morse et al., 2020, p. 364). Sofia did the opposite. How would you find the right amount with a new manager?
2. Can you really "choose your manager" as a new graduate? What could you find out before accepting an offer?
3. Zelnick moved between industries he knew nothing about (p. 43). What made that possible, and would it work in a regulated engineering field?
4. Which item in Table 5.1 is most likely to be crowded out in a busy first year? How would you protect it?

Assignment — Your manager and your learning (Launch Plan, Part 3)

Task.

1. Write the questions you will ask in your first one-to-one with a new manager to learn what they need to know, how often, and in what form.
2. Write one piece of completed staff work (Figure 5.1) on a real problem from your capstone or co-op, in no more than one page.
3. Build your own version of Table 5.1 for your first three years, with specific sources and hours.
4. Write a one-paragraph summary of Parts 1–3 as your *Launch Plan*.

Deliverable and due date. Two pages plus the staff-work page, as one PDF, due at the end of week 3.

Marking (15 marks).

- *One-to-one questions* (3): specific questions on needs, frequency and form (3); two of the three (2); generic (1); missing (0).
- *Completed staff work* (5): problem, options, recommendation and decision all clear (5); one element weak (4); two weak (3); three weak (2); a problem with no options (1); missing (0).
- *Learning plan* (4): specific sources and realistic hours for all five rows (4); four rows (3); fewer or vague (2); generic (1); missing (0).
- *Summary* (3): consistent with Parts 1–3 and your Two-Year Plan (3); consistent but generic (2); inconsistent (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Sofia what to decide; it shows what the exhibits say and one defensible response.

6.1 What the exhibits show

- **Exhibit 1: people converted, postings did not.** Online applications took 70 of her 112 hours and produced no offer. Informational meetings took 30 hours and produced all the referrals she recorded and the only offer (Figure 3.1). One search is an anecdote, but it matches the research on weak ties (Rajkumar et al., 2022).

- **Exhibit 2: specific beats general.** The rewritten résumé line shows scope and a measurable result; the new closing commits Sofia to a next step, as Zelnick advises (p. 43); the homework shows interest in Halden's actual problems.

- **Exhibit 4: the right instincts, badly calibrated.** Protecting concentration was sensible; a weekly batch was not. Long hours were meant as commitment; they bought little. The unannounced fix and her silence in reviews hid good work and good judgement.

- **Exhibit 5: a manager telling her what he values.** Arjun asks for predictability, information and her voice — not more hours. The offer is itself evidence: managers do not hand visible cross-team projects to people they doubt.

6.2 A worked response

Table 6.1 maps each concern in Exhibit 5 to a change and to the chapter that supports it.

Table 6.1: Sofia's response to her 90-day check-in: one reasonable plan.

Concern	Change	Chapter
Hard to reach	Batch messages at 9:00, 13:00 and 16:30; acknowledge blocking requests the same day (Figure 4.2); tell the QA lead about the new rhythm	4
Manager surprised	A short Friday note to Arjun: done, next, risks; completed staff work for decisions (Figure 5.1)	5
Long hours	Arrive at 8:00, leave by 17:30 on most days; two protected deep-work blocks a week	4
Silent in reviews	Prepare one observation for each design review, and say it in one sentence with evidence	4

6.3 One defensible sequence

1. **Reply to Arjun on Monday**, before the week starts: thank him, say what she will change, and ask one question about the migration — what "done" looks like in March.

2. **Accept the migration, with conditions she proposes.** It is the stretch assignment Table 5.1 calls for, and declining it would repeat the avoidance Lecture 2 warned about. She should propose a scope, a weekly status note, and a first design-review slot in January.

3. **Fix the rhythm first.** The new message batches and working hours start this week, because the migration will multiply the messages she receives.

4. **Tell the QA lead directly** that she was slow to reply, what has changed, and how to reach her when something is blocking.

5. **Start the P.Eng. experience log** with the harness fix and the migration: both are good evidence of engineering competence.

> **The one-sentence version of this lecture.** Find the job through people as well as postings, doing your homework and following up; then start by being reliably early, responsive and visible rather than endlessly busy, keep your manager free of surprises, and treat the first 1,000 days as an apprenticeship you direct yourself.

Glossary

Apprentice stage The first of Dalton and Thompson's career stages, in which the new professional learns from others and seeks harder tasks (Morse et al., 2020, p. 367).

Completed staff work Presenting a problem with alternatives and a recommended action, so that the manager can decide without redoing the work (Morse et al., 2020, p. 364).

Feedback seeking Actively asking others how you are doing (Anseel et al., 2015).

Informational meeting A conversation to learn about a field or organisation; Zelnick treats it as a sales call that ends by asking about opportunities (p. 44).

Leader–member exchange The quality of the working relationship between a manager and an employee (Dulebohn et al., 2012).

Newcomer socialisation The process by which new employees learn their role, gain confidence and are accepted (Bauer et al., 2007).

Passive face time Being seen at work without interacting, which leads observers to infer traits such as dependability (Elsbach et al., 2010).

Psychological safety A shared belief that a team is safe for interpersonal risk-taking (Edmondson, 1999).

Referral A recommendation of a candidate by someone known to the employer.

Responsiveness rule Zelnick's rule of returning calls and messages the same day (p. 85).

Safety class Under IEC 62304, the classification of medical-device software (A, B or C) by the severity of harm its failure could cause (IEC, 2015).

Structured interview An interview in which every candidate gets the same job-related questions, scored against the same rubric (Sackett et al., 2022).

Technical obsolescence No longer knowing or being able to apply what one's profession considers important (Shannon, quoted by Morse, Schell & Babcock, 2020, p. 374).

Weak tie An acquaintance, as opposed to a close friend or family member (Granovetter, 1973).

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 2. Its job is to make the job search and the first year concrete: most students overuse online applications, and most new graduates misread what their first manager wants. The case suits the winter term, when searches are under way. Materials: two anonymised résumé lines from volunteers, and a printed copy of Exhibit 5.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Hand vote: should Sofia accept the migration? Record the split. Ask each side for one reason.
10–30	The search	Compute offers per hour from Exhibit 1; show Figure 3.1. Rewrite the two volunteer résumé lines live, using Exhibit 2 as a model.
30–50	Starting well	Figure 4.1: ask who plans to work 55-hour weeks and why. Walk the responsiveness protocol (Figure 4.2) with a volunteer's anonymised inbox.
50–65	Your manager and your learning	Pairs rewrite Sofia's harness fix as completed staff work (Figure 5.1), 10 minutes; then Table 5.1 and the 70–20–10 myth check, 5 minutes.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); assign Part 1 of the Launch Plan (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: 0 offers from 70 hours of applications, 1 from 30 hours of meetings; referrals and tailored homework explain it. Q2: the measurable result; the closing that commits to a follow-up. Q3: slow replies held up a regulated team; the idea of batching was sound, the interval was not. Q4: he values predictability and judgement; hours are an input, not an output. Q5: most defensible answers accept, after fixing the rhythm and agreeing scope.

Chapter 3

Q1: persistence adds value each time (news, a question, a thank-you); pestering repeats the request. Q2: weak ties bridge to new circles; strong ties help when trust or urgency matters. Q3: alumni lists, cold outreach and homework are open to anyone; career offices can supply the first ties. Q4: match the posting's language where it truthfully describes you; never claim skills you lack.

Chapter 4

Q1: visibility is a signal; it is honest when the work behind it is real. Remote work shifts the signal to responsiveness and written updates. Q2: most students settle on two or three

batches a day. Q3: state facts and results, and credit others. Q4: in short bursts for real needs; not as a routine.

Chapter 5

Q1: ask in the first one-to-one, then adjust after a month. Q2: ask to meet the manager during interviews; ask current team members how feedback works. Q3: transferable skills and fast learning; regulated fields add a licensing and standards layer that takes time. Q4: reading and the licensure log; schedule them.

Marking guidance

A strong Part 1 shows requests actually sent. A strong Part 2 has a working pattern the student could keep for a year. A strong Part 3 contains completed staff work a manager could approve as written; a weak one describes a problem and asks the manager what to do. The three parts total 40 marks. Students may anonymise employers and people.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. His "fifteen minutes earlier … and fifteen minutes later" rule (p. 51) is about being seen and being reliable, not about long hours; the evidence on hours (Figure 4.1) helps students keep it in that spirit.
2. The Bobby story (pp. 86–88) is memorable because the stakes were high; the everyday reasons he gives for responsiveness (p. 85) are the ones that apply to most unreturned emails.
3. His job-search advice (pp. 41–46) comes from business roles; regulated engineering adds licensure and, in Ontario, new posting rules (Ontario, 2026), which the lecture covers.

None undermines his argument, and spotting them models the habit of checking sources.

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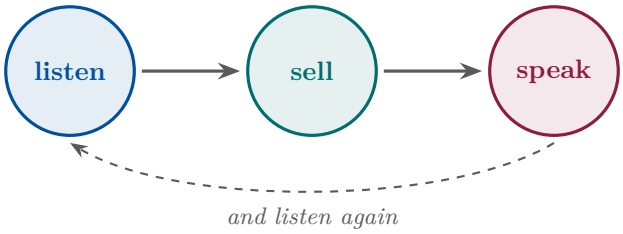
Success as an Engineer — Professional Practice Series

Lecture 4

Listen, Sell, Speak

Getting good engineering adopted

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Relay Upgrade (electrical / power systems)
Year:	2026



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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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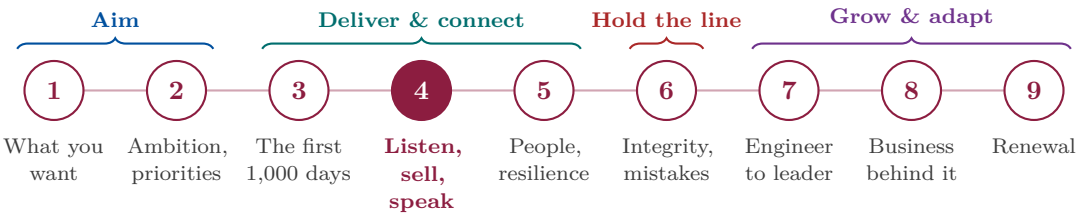
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Chapter 1

About This Lecture



Good engineering that nobody adopts changes nothing. Somewhere between the analysis and the installed equipment sits a person who has to say yes: a manager, a client, a committee. This lecture is about the three skills that decide whether they do. Listening is the first of three answers Zelnick kept hearing from successful executives; selling, he says, is a skill everyone needs; and he learned the third, speaking, the hard way.

Learning objectives

By the end of this lecture you will be able to:

- **Listen** in a way that uncovers what a decision-maker actually needs, and explain what the research says about why high-quality listening changes the speaker.
- **Decide** when to listen first and when to make the first offer in a negotiation.
- **Sell** an engineering proposal using Zelnick's six steps, adapted to a capital request, and judge which popular persuasion claims hold up.
- **Write** a one-page executive summary and **build** a short briefing with assertion–evidence slides.
- **Recognise** two communication myths that even an engineering textbook repeats.
- **Produce** your *Proposal Kit*: three short parts, built across the chapter assignments, for a real proposal from your capstone or co-op.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: the listening rule in "The Three Rules", the chapter "Everyone Should Be a Salesman" and "The Key to Effective Public Speaking".

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: their section "Communicating Your Ideas" covers the communication process, listening, written reports and oral briefings.

Peer-reviewed research tests both — and in this lecture it corrects two claims the textbook

itself repeats.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Proposal Kit

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Omar's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Proposal Kit**, for a change you want adopted on your capstone or co-op: Part 1 (a listening log and stakeholder map, due at the end of week 1), Part 2 (a sales plan, due at the end of week 2) and Part 3 (an executive summary and a five-minute briefing, due at the end of week 3).

Chapter 2

Case Study: The Relay Upgrade

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Monday 15 February 2027, 6:50 a.m.

Omar Haddad, an electrical engineer-in-training at Lakeshore Dairy's processing plant in Belleville, Ontario, walked past motor control centre 3 on his way in, as he had every day since 26 January. On that Tuesday an electrician racking a breaker in MCC-3 had triggered an arc flash. He was wearing the arc-rated suit the plant's study required, and he walked away with a scorched suit and a ringing in his ears. Everyone agreed he had been lucky.

Omar had joined the plant eighteen months earlier. In October a consultant's arc-flash study, prepared to CSA Z462, the Canadian standard for workplace electrical safety, had shown incident energies close to the 40 cal/cm^2 rating of the category 4 suits the plant used (CSA Group, 2024). Omar had spent his evenings designing a fix. On 3 March he would have ten minutes in front of the plant's capital committee to ask for $310,000. His first attempt had gone nowhere.

2.2 The first attempt

On 1 February, six days after the arc flash, Omar emailed the plant manager (Exhibit 1).

Exhibit 1 — Omar's email, Monday 1 February 2027 (extract)

To: Luc Gagnon, Plant Manager **Subject:** Arc flash study results and recommended protection upgrade

Hi Luc, following the October arc-flash study (IEEE 1584-2018 method, 46-page report attached) and last week's event in MCC-3, I have evaluated several mitigation options including current-limiting fuses, zone-selective interlocking, a maintenance mode switch and optical arc-flash relays. [Nine paragraphs of analysis followed, with two tables of incident energy at each bus; the two planned shutdowns were mentioned in the third paragraph.] My recommendation is Option D. Let me know what you think.

Luc did not reply. Eleven days later, Omar's mentor, Wei Chen, P.Eng., suggested he find out why before he walked into the committee. Omar spent Friday afternoon with the maintenance supervisor, Denise Bouchard, who had been at the plant for twenty-two years (Exhibit 2).

Exhibit 2 — Omar's notes on Denise Bouchard, 12 February 2027

- Luc still talks about the 2024 compressor upgrade: engineering said 8 hours of downtime; it took 30. "He reads 'shutdown' and stops reading."
- The CFO, Martin Leclerc, rejects discretionary projects with a payback over three years — *unless* the joint health and safety committee has rated the risk "critical". Nobody has asked them to.
- "My guys hate the category 4 suits. Routine jobs get put off because suiting up takes forty minutes. If your fix meant we didn't need them for routine work, they'd carry you in on their shoulders."
- The sister plant in Guelph lost nine days of production after an arc flash in 2019. "Martin was there."

2.3 The numbers

Omar's own summary of the proposal is in Exhibit 3.

Exhibit 3 — Option D in numbers

Item	Value
Scope	Optical arc-flash relays on the main switchgear and MCCs 1–4 (the five buses above 8 cal/cm^2 of the 14 studied), with a trip signal to the utility-side protection for faults upstream of the main breaker; zone-selective interlocking; a maintenance mode switch
Incident energy at main switchgear, now → after	38 → under 4 cal/cm^2[a]
Incident energy at MCC-3, now → after	27 → under 4 cal/cm^2
Installed cost	$310,000
Downtime	Two planned Sunday shutdowns of 12 hours (the line runs six days a week)
Annual savings	About $27,000 in technician time (no category 4 suits for routine work); about $18,000 lower insurance premium (broker's estimate)
Simple payback on savings	$310,000 ÷ $45,000 a year ≈ 6.9 years
Avoided loss (not in payback)	A nine-day outage like Guelph's would cost about $1.1 million in lost margin

[a] Provided arcs upstream of the main breaker are cleared by the utility-side protection within about 0.1 s.

2.4 The dry run

On Monday evening Omar ran through his 14-slide presentation for Wei. The first slide was titled "Arc Flash Hazard Analysis per CSA Z462:24 and IEEE 1584-2018". Slides 2 to 9 explained the calculation method. The cost appeared on slide 12. Wei's notes are in Exhibit 4.

Exhibit 4 — Wei Chen's notes on the dry run

You spoke for 22 minutes; you have 10, plus 5 for questions. I still do not know what you want the committee to decide until slide 12. The method slides are for an engineering review, not this room. Luc will ask about downtime in the first minute; Martin will ask about payback; Denise's crew is your best evidence and they are not in the deck. Nobody in that room doubts that arc flash is dangerous. They doubt that this project will be done on time and is worth the money. And you read the slides.

Omar had sixteen days. He knew the engineering was right. He was no longer sure that was the point.

Discussion questions

Before reading further, write a short answer to each question.

1. Why did Exhibit 1 fail? Name three reasons, from Luc's point of view.
2. What did Omar learn in one afternoon with Denise that his study could not tell him?
3. The simple payback in Exhibit 3 is 6.9 years. Is the project therefore dead? What would change the decision rule?
4. Who should Omar talk to before 3 March, and in what order?
5. Rewrite the title of Omar's first slide so that it states what he wants.

We return to Omar in Chapter 6.

Chapter 3

Listen First

3.1 The first of the three rules

Zelnick's argument

The first answer Zelnick heard from successful executives was *listen*. He learned it from Steve Ross, chief executive of Warner Communications, who at a dinner party found himself seated next to the host's teenage son. Instead of ignoring him, Ross "listened closely as he talked avidly about rock music and his favorite artists." Days later Ross joined a meeting to sign an artist to a Warner label, and "his careful attention to the teenager at the dinner party enabled him to appear just knowledgeable enough about current music to help close the deal. The artist? Sting" (pp. 47–48).

"Most of us are pretty good talkers. ... However, in professional life, perhaps even more particularly at higher levels, talking becomes much less important than listening" (p. 48). "It's never a good idea to talk first, to talk too much, to talk before we know enough — or to interrupt" (p. 48).

Zelnick is specific about what good listening looks like: "not just listening, but listening carefully and empathetically" — looking at the speaker, nodding and, where it helps, "repeating their remarks back to them in a summary fashion ('so you're essentially saying that...')" (p. 49). He credits this to Dale Carnegie, and adds a warning that engineers in particular should heed: "Someone who wants to lead often assumes that the best way to do so is quickly to assess, understand and solve a problem. In fact, that approach often yields frustration, misunderstandings, truncated discussions, and even ill will" (p. 49).

Omar's email in Exhibit 1 is that approach in writing. He assessed, understood and solved the problem — and never asked Luc what worried him.

What Morse, Schell & Babcock add: active listening and the communication process

Morse, Schell & Babcock model communication as a chain: the sender encodes a thought, transmits it through a medium, and the receiver decodes it; understanding can be "obstructed by prejudices, or by a desire not to hear or believe what is actually being said", and feedback lets the sender find out what was actually understood (Morse et al., 2020, p. 369). Their advice on *active listening* matches Zelnick's: "Listen positively and attentively, allowing the speaker to make his or her point ... Try to reach beyond the speaker's words to his or her meaning. When in doubt, rephrase the speaker's words with a 'Do I understand that ...?' " (Morse et al., 2020, p. 371).

Figure 3.1 applies their model to Omar's email.

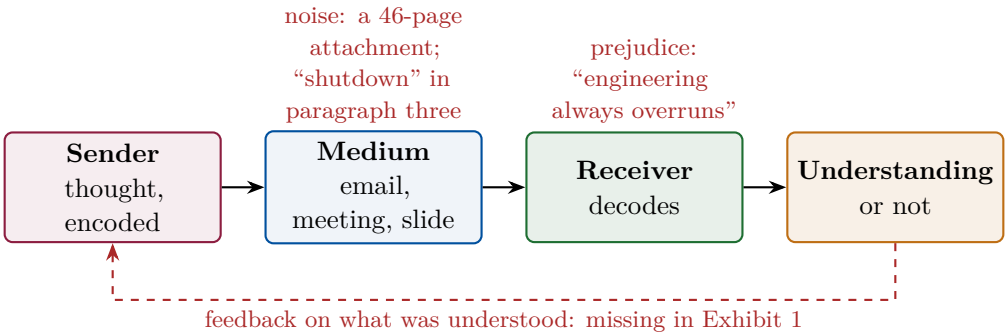


Figure 3.1: The communication process as Morse, Schell & Babcock describe it (2020, pp. 369–370), annotated with what went wrong in Omar's email. Omar's message had no feedback loop: he never learned what Luc understood.

What the research says: listening changes the speaker, not just the listener

- **Listening at work pays.** A review of research on listening in organisations found that being listened to well is associated with speakers' trust, well-being and performance, and with better relationships with managers (Kluger and Itzchakov, 2022).
- **Good listening lowers anxiety.** In experiments, people who spoke to a high-quality listener felt less socially anxious and held more complex, less extreme attitudes about their own position (Itzchakov et al., 2017). The author's inference: a decision-maker who feels heard is likely to be more open to a proposal that challenges them.

3.2 Listen before you propose — usually

Zelnick's argument

"The best negotiators listen first and make proposals only when absolutely pressed to do so" (pp. 49–50). At Vestron, negotiating Canadian distribution for its films, Zelnick's team arrived in the early evening and were ushered straight into a conference room — he wondered if the other side hoped to negotiate while they were tired and hungry — and heard an offer that already exceeded their minimum. Zelnick listened and suggested dinner instead. The other side conferred and sweetened the offer; he demurred again; they returned "with an even better offer. They proceeded to negotiate against themselves for some time. All we did was listen and continue to suggest a dinner break. … Ultimately, we countered and closed on terms substantially better than those for which we'd hoped" (pp. 50–51).

The story is memorable, and it is half the truth. Negotiation research shows that the first number on the table tends to pull the outcome towards it.

What the research says: first offers anchor — which complicates Zelnick

In negotiation experiments, the side that made the first offer tended to get the better outcome, because the first offer anchored the discussion. The advantage disappeared when the other side concentrated on the first party's alternatives or reservation price, or on its own target (Galinsky and Mussweiler, 2001). So Zelnick's advice is right when you do not yet know what the other side values or will accept — which is most of the time for a new engineer. When you *do* know the range, an ambitious, well-justified first proposal is, in the author's reading of this evidence, usually better than waiting.

Engineering translation

For an engineer, "listen first" has a concrete meaning: before you propose a design change, find out what each decision-maker is afraid of, what rule they will apply, and what evidence would move them. Denise gave Omar all three in one afternoon: Luc fears overruns, Martin applies a three-year payback rule with a safety exception, and the maintenance crew's lost hours are evidence nobody had counted. None of it was in the 46-page study.

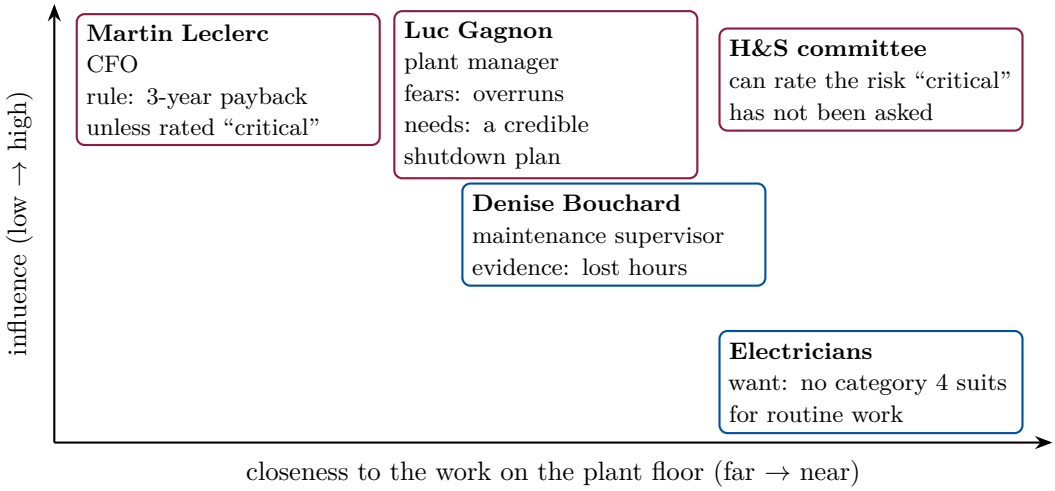


Figure 3.2: A stakeholder map for Omar's proposal, built from Exhibit 2: who decides or holds a decision rule (garnet), who influences or supplies evidence (blue), and what each needs. Denise and the electricians have less formal say than the decision-makers but supply the strongest evidence. Positions are judgements; the point is to find them out by listening before proposing.

Capstone move

Before your next capstone decision, spend ten minutes with the person most likely to object — a sponsor, a supervisor, a teammate — and ask only questions. Summarise what they said back to them ("so you're essentially saying…") before you say anything about your own view.

Discussion questions

1. Zelnick says talking "becomes much less important than listening" at higher levels (p. 48). Why might that be truer for managers than for new engineers — or is it equally true?
2. When should an engineer make the first proposal rather than listen? Use Galinsky and Mussweiler (2001) to argue both sides for Omar's capital request.
3. Summarising back ("so you're saying…") can sound mechanical. How do you make it genuine?
4. Which stakeholder in Figure 3.2 would you meet first, and why?

Assignment — Listening log and stakeholder map (Proposal Kit, Part 1)

Task.

1. Choose one change you want adopted on your capstone or co-op (a design change, a test, a tool, a process).
2. Hold three listening conversations with people affected by it, asking only questions for at least the first ten minutes. For each, record what they fear, the rule they will apply, and the evidence that would move them.
3. Draw a stakeholder map like Figure 3.2.
4. Write one paragraph on what you learned that you could not have learned from your own analysis.

Deliverable and due date. Two pages (PDF), due at the end of week 1.

Marking (10 marks).

- *Conversations* (4): one mark per complete conversation, plus one if all three are complete. A conversation is complete when fears, rule and evidence are all recorded.
- *Stakeholder map* (3): decision-makers and influencers clearly placed, with needs (3); placed without needs (2); a list only (1); missing (0).
- *Reflection* (3): a specific insight that changed the proposal (3); a specific insight, no change (2); generic (1); missing (0).

Chapter 4

Everyone Should Be a Salesman

4.1 Why an engineer sells

Zelnick's argument

Zelnick's first job after graduating was selling television programmes internationally for Columbia. The head of McKinsey's media practice, Carter Bales, whom he met on the street, laughed: "Well, if you do that, you'll be a salesman for the rest of your life." Zelnick: "As it turns out, Carter was absolutely right" (p. 124). He was not a natural salesman, "but I was a quick study, and I was motivated to succeed, so I learned how to sell. And that skill set transferred almost precisely into that which is required to effectively lead and manage other people" (p. 125).

"Business is all about sales because sales is all about listening, understanding others, building relationships and practicing advocacy — whether it's for yourself, your firm or your product" (p. 125).

Many engineers hear "sales" and think of someone pushing a product. Zelnick's definition is closer to engineering than it sounds: find out what the other person needs, and show that your proposal meets it. Every design review, change request and capital proposal is a sale in that sense.

4.2 Zelnick's six steps

Zelnick says he has turned to the same six steps "again and again as my career has progressed" (p. 125). Figure 4.1 shows them, with what each meant for Omar.

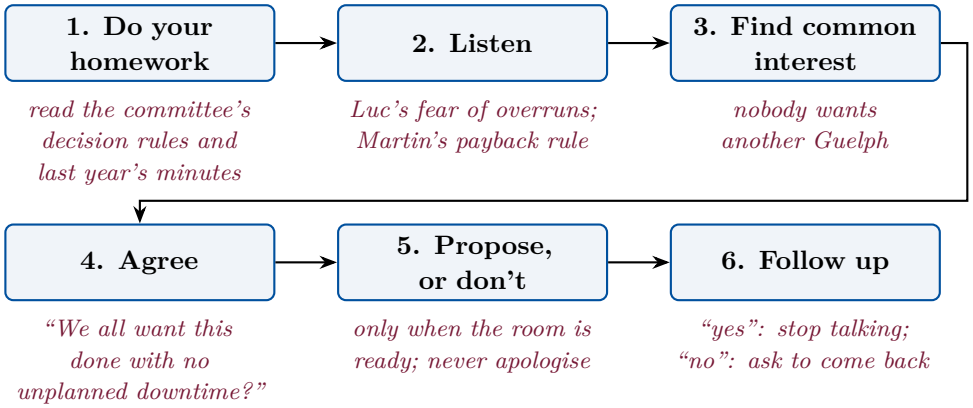


Figure 4.1: Zelnick's six steps to a sale (pp. 125–128), with what each meant for Omar's capital request (italics, this lecture's application).

- **Do your homework.** "Before any meeting, do some research on the person you're seeing,

including their professional background, current responsibilities and personal interests. In the age of the Internet, this kind of research is not only easy, it's considered polite" (p. 125).

- **Listen.** Zelnick simply refers back to the three rules and Steve Ross (p. 126).
- **Find areas of common interest.** "Your job is to focus on what matters to him or her, not on what you had in mind for the meeting. Eventually, the conversation will come around to what you're there for" (p. 126).
- **Agree.** Ask a question to which the answer is "yes" — his example: "I know your company prides itself on operating at the lowest cost in your business. Are you interested in reducing your fuel costs?" Citing Roger Fisher, co-author of *Getting to Yes*, he says the word "yes" "has a unique power to create an atmosphere of agreement" (pp. 126–127).
- **Make your proposal — or don't.** Propose only if the engagement is warm and you know what the other party wants; otherwise wait. "Never apologize" ("I know this may not be right for you, but…") (p. 127).
- **Follow up.** If the answer is yes, "Never, ever continue talking once you have reached agreement. … 'Just take yes for an answer.' " If it is no, remember a classmate's line: "'No' is just the beginning of the sale"; thank the person and ask to stay in touch (p. 128).

What the research says: what holds up

- **Small agreements help, a little.** In a classic experiment, people who first agreed to a small request were far more likely to agree to a larger one later (Freedman and Fraser, 1966). A later review found the effect real but modest and dependent on conditions, most reliably when the first request leads people to see themselves as the kind of person who helps (Burger, 1999). Zelnick's "yes" step works best as genuine agreement on a shared goal, not as a verbal trick.
- **Interests, not positions.** Fisher and Ury (1981), whose book Zelnick cites, argue that agreements come from uncovering the interests behind stated positions. Omar's position was "Option D"; Luc's interest was no more overruns, and Martin's was a defensible use of capital.

4.3 Selling an engineering proposal

Engineering translation

An engineering proposal is sold on the decision-maker's terms, not the engineer's. Three moves follow from the six steps; Table 4.1 shows the result for Omar:

- **Frame by the decision rule.** Martin's rule has a safety exception. The first "sale" is to the health and safety committee: ask them to assess the risk. That is homework, not a trick.
- **Answer the fear before it is voiced.** Luc fears overruns, so the proposal leads with a shutdown plan: two Sundays, pre-assembled panels, a rehearsed cutover and a named rollback.

- **Bring evidence people trust.** Denise's crew and the Guelph outage are more persuasive in that room than a table of incident energies.

Table 4.1: Omar's proposal reframed for each decision-maker. The engineering is the same in every row.

Audience	What they need to hear first	Evidence
H&S committee	The risk at MCC-3 and the main switchgear, and what it would take to make routine work safe without category 4 suits	Study results; the 26 January event; CSA Z462's preference for engineering controls over protective clothing
Luc (plant manager)	Two planned Sunday shutdowns, with a cutover plan and rollback	A rehearsed plan; the contractor's schedule; what went wrong in 2024 and what is different
Martin (CFO)	Classification as a critical safety risk; savings and the avoided loss	$45,000 a year in savings; a nine-day outage costs about $1.1 million
Maintenance crew	Fewer suited jobs, and routine work no longer deferred	Their own estimate of hours spent suiting up

Myth check: "A good salesperson can sell anything"

The phrase suggests that persuasion is about technique. The persuasion knowledge model cuts against this: once people recognise a persuasion tactic, they can discount the message and the messenger (Friestad and Wright, 1994). Zelnick's own steps agree: three of the six — homework, listening and common interest — are about understanding the other person, a fourth seeks genuine agreement, and step 5 tells you not to propose at all if the fit is not there. For engineers, persuasion that outruns the evidence is not just ineffective in the long run; overselling a safety-related design can breach the professional obligation to put the public first, which Lecture 6 takes up.

Capstone move

Pick one decision you need from your sponsor or supervisor this month. Write down their decision rule (what would make them say yes) before you write a single slide.

Discussion questions

1. Zelnick says selling "transferred almost precisely" into leading people (p. 125). What does an engineering lead sell, and to whom?
2. Is asking the health and safety committee to rate the risk a legitimate step or a way round the CFO's rule? What would make it one or the other?
3. "Never apologize" (p. 127). When should an engineer state uncertainty in a proposal, and how is that different from apologising?
4. "'No' is just the beginning of the sale" (p. 128). When is no the end?

Assignment — Your sales plan (Proposal Kit, Part 2)

Task. For the change you chose in Part 1:

1. Write each decision-maker's decision rule, in their words if possible.
2. Build a table like Table 4.1: what each audience needs to hear first, and the evidence.
3. Write the "agree" question you would ask to open the key meeting, and the proposal sentence you would use if the room is ready.
4. Plan your follow-up for a "yes" and for a "no".

Deliverable and due date. Two pages (PDF), due at the end of week 2.

Marking (15 marks).

- *Decision rules* (3): specific rule for each decision-maker, sourced (3); specific but guessed (2); generic (1); missing (0).
- *Reframing table* (5): every audience with a distinct first message and credible evidence (5); one weak row (4); two weak rows (3); three or more weak rows (2); messages identical across audiences (1); missing (0).
- *Agree question and proposal* (4): a genuine shared goal and a confident, honest proposal (4); one of the two strong (3); both present but weak (2); manipulative or apologetic (1); missing (0).
- *Follow-up* (3): specific plans for yes and no (3); one of the two (2); vague (1); missing (0).

Chapter 5

Speak and Write So Decisions Get Made

5.1 “I had no idea you were such a terrible public speaker”

Zelnick’s argument

Zelnick assumed that good writing plus clear delivery would make him a good speaker. As the new president of Vestron he gave the after-dinner keynote at a retailers’ convention: weeks of drafts, read “stiffly at the podium”, about “our industry, our company and our strategy.” Afterwards the chairman said quietly, “I had no idea you were such a terrible public speaker. … We have to get you some training” (p. 129).

He spent two days with Jim Abernathy, an investor-relations strategist and media trainer, and lists what he learned (pp. 130–131):

1. “Focus foremost on what your audience cares about, not on what you want to get across”; “speaking is a form of sales, and the same rules apply.”
2. Avoid the use of “I” as much as possible.
3. “Know your material cold.”
4. Then do away with a prepared text; use brief notes.
5. Tell the audience what you will cover, cover it, and summarise.
6. “Speeches should rarely last longer than twenty minutes. … No one will ever complain that a speech was too short.”
7. Use humour if it comes naturally, but no prepared jokes.
8. Speak to two or three people in the audience.
9. Smile.
10. “As much as possible, be yourself.”

Wei’s notes on Omar’s dry run (Exhibit 4) read like Abernathy’s list in reverse: the talk was about the method, not the audience’s concerns; it ran more than twice the time; and he read the slides.

What the research says: speaking is a trainable skill

Fear of public speaking is common and treatable. A meta-analysis of 30 randomised trials found that psychological interventions — mostly cognitive-behavioural methods such as exposure, desensitisation and relaxation — reduced public-speaking anxiety with a medium-to-large effect (Hedges' $g = 0.74$); in trials with follow-up, $g = 1.11$ (Ebrahimi et al., 2019). The trials confirm what Zelnick's two days with a coach showed him: structured practice reduces the fear that stops people rehearsing.

5.2 The briefing and the written report

What Morse, Schell & Babcock add: briefings and reports

Morse, Schell & Babcock define a briefing as "an oral presentation of analyzed and synthesized information, presented to a person or group of people who have a need or desire for knowledge, but who do not have the time to become thoroughly familiar with all the details of a subject". "The essence of effective oral briefing is preparation and practice", and briefing skills "are essential for career success, for the busy executives who will make the final decision on whatever you are proposing often can be approached in no other way" (Morse et al., 2020, pp. 372–373).

For written reports they recommend an executive summary of one page that answers the question "If the busy reader is only going to look at this page, what do they need to know?", with conclusions and recommendations at the front (Morse et al., 2020, p. 372). And they report that, in Timm's comparison of media, an oral presentation supported by a written one was the most effective (Morse et al., 2020, p. 371).

Figure 5.1 applies both ideas to Omar's ten minutes: the decision comes first, the method only if asked, and a one-page summary goes to the committee beforehand.

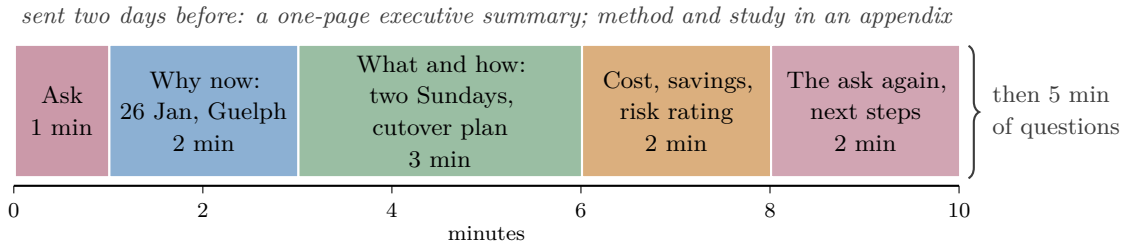


Figure 5.1: A ten-minute decision briefing for Omar, putting the decision first as Morse, Schell & Babcock advise for executive summaries (2020, p. 372) and keeping to Abernathy's rule, as Zelnick reports it, that no one complains a talk is too short (p. 131).

5.3 Slides that make a claim

Omar's slide titles named topics ("Arc Flash Hazard Analysis per CSA Z462:24"). Engineering education research suggests a better default.

What the research says: assertion–evidence slides

In experiments with engineering students, slides whose headline was a full-sentence claim, supported by a visual rather than bullet points, produced better comprehension than the familiar topic-and-bullets design (Garner and Alley, 2013). Morse, Schell & Babcock advise "Avoid sentences, paragraphs, or long blocks of text" on slides (Morse et al., 2020, p. 373); the two pieces of advice fit together: one sentence as the headline, and no blocks of text beneath it. Figure 5.2 shows the difference for one of Omar's slides.

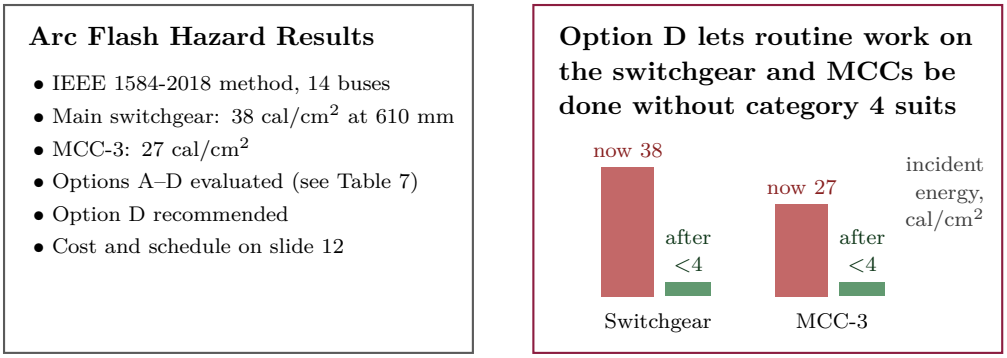


Figure 5.2: The same content as a topic-and-bullets slide (left) and an assertion–evidence slide (right), after Garner and Alley (2013). Bars show incident energy now and after Option D (Exhibit 3), drawn to scale.

Myth check: "Only 7% of communication is words"

Morse, Schell & Babcock report Mehrabian's division of the aspects of oral communication into "7 percent: Verbal … 38 percent: Vocal … 55 percent: Facial" (Morse et al., 2020, p. 372). The figures come from two small 1967 experiments in which listeners judged a speaker's *feelings* (liking or disliking) from single words spoken in a tone that conflicted with their meaning (Mehrabian and Wiener, 1967), or from the word "maybe" spoken in different tones alongside photographs of faces (Mehrabian and Ferris, 1967). Mehrabian himself has said that the equations do not apply unless a communicator is talking about feelings or attitudes (Mehrabian, n.d.). Delivery matters; but in a capital briefing, the words and numbers carry most of the message.

Myth check: "We remember 10% of what we read and 90% of what we say and do"

Morse, Schell & Babcock also reproduce a table of retention rates — "10 percent of what we read" rising to "90 percent of what we say and do" (Morse et al., 2020, p. 370). This "learning pyramid" is widely repeated in education and training, but a review found no empirical study behind the percentages (Masters, 2013). The sensible idea underneath — people understand more when they take part — does not need invented numbers. Use discussion and demonstration because they help, not because of a chart.

2026 context: AI-drafted slides and summaries

By 2026 many engineers have access to AI tools that draft slides, summaries and emails in seconds. The author's reading: they are useful for first drafts and for tightening prose, but they tend to produce exactly the topic-and-bullets slides and generic summaries this chapter warns against, and they do not know your audience's fears or decision rules. The listening and the claim are still your job — and so is the accuracy of every number, which remains your professional responsibility.

Discussion questions

1. Abernathy's second rule is to avoid "I". Why might that matter more for an engineer proposing a design than for a keynote speaker?
2. Zelnick says to drop the prepared text (p. 130). When should an engineer read from a script (for example, in a safety briefing or a regulatory hearing)?
3. Morse, Schell & Babcock quote Mehrabian and the retention table as facts. What should a reader do when a trusted textbook repeats a claim that does not hold up?
4. Rewrite the title of one slide from your last presentation as an assertion.

Assignment — Executive summary and briefing (Proposal Kit, Part 3)

Task. For the change you chose in Part 1:

1. Write a one-page executive summary that states the decision you want in its first sentence, following Morse, Schell & Babcock's test for the busy reader.
2. Build a five-minute briefing of no more than five assertion–evidence slides.
3. Rehearse it twice with a listener and a timer; record the times and the changes you made.
4. Write a one-paragraph introduction to your *Proposal Kit* that summarises Parts 1–3.

Deliverable and due date. Introduction, summary, slides and half-page rehearsal record, one PDF of no more than four pages plus slides, end of week 3.

Marking (15 marks).

- *Executive summary* (5): decision first, audience's concerns answered, one page (5); one weakness (4); two (3); three or more (2); decision buried (1); missing (0).
- *Slides* (4): every headline a claim, every slide with visual evidence (4); most (3); half (2); topic-and-bullets throughout (1); missing (0).
- *Rehearsal* (3): two timed, each followed by a recorded change (3); two timed, or one with a change (2); one without a change, or untimed (1); none (0).
- *Introduction* (3): consistent with Parts 1–3 (3); generic (2); inconsistent (1); none (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Omar what to say on 3 March; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 answers a question Luc did not ask.** It opens with the method, buries the shutdown in the analysis, attaches 46 pages and ends without a specific ask (amount, decision, date) or a follow-up. By Zelnick's steps it skipped homework, listening, common interest and agreement, and made a proposal without follow-up (Chapter 4).
- **Exhibit 2 is the most valuable afternoon Omar has spent.** It gives each decision-maker's fear and rule (Chapter 3), a path through the payback rule, and evidence from the people who do the work.
- **Exhibit 3 is right but framed for the wrong test.** On savings alone the payback is 6.9 years, so as a discretionary project it fails. As a critical safety risk, which the health and safety committee can assess, it is judged differently — and the avoided-loss figure belongs in the discussion even though it is not in the payback.
- **Exhibit 4 is Abernathy's list in reverse.** Too long, about the method rather than the audience, read from the slides, with the ask on slide 12 (Chapter 5).

6.2 A worked plan for the next sixteen days

Table 6.1: One plan for Omar's sixteen days before the committee.

When	Action	Chapter
This week	Ask the H&S co-chair for a risk assessment at their next meeting; ask Denise's crew to estimate suiting-up hours; meet Luc for twenty minutes and ask only about the 2024 overrun	3
Next week	Build the cutover plan with the contractor; rework the proposal by audience (Table 4.1); pre-brief Martin by phone with the payback and the risk rating	4
1 March	Send a one-page executive summary with the ask in the first sentence	5
3 March	A ten-minute briefing (Figure 5.1), five assertion–evidence slides, rehearsed twice with Wei	5
After	"Yes": stop talking and send the schedule. "No": ask what would change it, and when to come back	4

6.3 One defensible first slide

> **Approve $310,000 so routine electrical work on the main switchgear and MCCs 1–4 can be done safely without category 4 suits — in two planned Sunday shutdowns.**

It states the ask, the benefit that matters to the people doing the work, and the answer to Luc's fear, in one sentence.

> **The one-sentence version of this lecture.** Listen until you know what each decision-maker fears and how they decide, sell the proposal on their terms with evidence they trust, and put the decision in the first sentence of everything you write and say.

Glossary

Active listening Attending closely to a speaker and checking understanding by rephrasing (Morse et al., 2020, p. 371).

Anchoring The pull of a first number on later judgements; in negotiation, the effect of a first offer (Galinsky and Mussweiler, 2001).

Arc flash A release of energy from an electric arc; *incident energy* (cal/cm^2) is the thermal energy at a working distance, used to select protective measures (CSA Group, 2024), often calculated with the IEEE 1584 method (IEEE, 2018).

Arc-flash relay (optical) A relay that detects the light of an arc and sends a trip signal within milliseconds, so that the breaker clears the fault sooner and incident energy falls.

Assertion–evidence slide A slide whose headline is a full-sentence claim supported by a visual (Garner and Alley, 2013).

Briefing An oral presentation of analysed information to people who lack time for the details (Morse et al., 2020, p. 372).

Decision rule The test a decision-maker applies, such as a payback threshold.

Executive summary A one-page summary that tells a busy reader what they need to know, with conclusions first (Morse et al., 2020, p. 372).

Foot-in-the-door The tendency to agree to a larger request after agreeing to a smaller one (Burger, 1999; Freedman and Fraser, 1966).

Interests and positions What people need, as opposed to what they say they want (Fisher and Ury, 1981).

Maintenance mode switch A switch that temporarily sets faster protection while people work on equipment.

PPE category 4 The highest arc-flash clothing category in CSA Z462 tables, with a minimum rating of 40 cal/cm^2 (CSA Group, 2024).

Simple payback Initial cost divided by annual savings.

Stakeholder map A picture of who decides, who influences and what each needs.

Zone-selective interlocking Communication between breakers so that the one nearest a fault trips without the usual time delay.

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 3. Its job is to show engineering students that adoption is part of engineering, and that listening, selling and speaking are learnable. Materials: printed copies of Exhibit 1 for a red-pen exercise, and a projector for Figure 5.2.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Red-pen Exhibit 1 in pairs: what would Luc read, and where would he stop? Vote: is the project dead at a 6.9-year payback?
10–25	Listen	Role-play: one student as Denise, one as Omar, asking only questions for four minutes. Build Figure 3.2 on the board.
25–45	Sell	Walk the six steps (Figure 4.1); groups each take one audience in Table 4.1. Discuss the first-offer evidence.
45–65	Speak	Show both slides in Figure 5.2; rewrite three slide titles from students' own decks. Cover the two myth checks.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); assign Part 1 of the Proposal Kit (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: no ask up front, the shutdown buried, a 46-page attachment, no follow-up. Q2: fears, rules and evidence. Q3: no — the safety exception and the avoided loss change the frame. Q4: Denise's crew and the H&S committee first, then Luc, then Martin. Q5: see Chapter 6.

Chapter 3

Q1: the higher the level, the more a decision depends on others' information; new engineers also gain by listening before proposing. Q2: Omar knows the cost and the rule, so a clear first proposal is reasonable; he does not yet know Luc's tolerance for downtime, so he should listen on that. Q3: summarise content and feeling, briefly, then ask if you have it right. Q4: start with Denise's crew for evidence, then the H&S committee, which holds the key to the decision rule; then Luc.

Chapter 4

Q1: priorities, designs and change — to managers, clients and their own team. Q2: legitimate if the risk is genuinely critical and the committee assesses it independently; illegitimate if it is used to dodge scrutiny. Q3: state uncertainty with its size and its consequences; apologising signals doubt about the proposal itself. Q4: when the answer rests on facts that will not change, or when pressing would damage trust.

Chapter 5

Q1: an engineer is asking for trust in a design; "I" shifts attention to the person. Q2: when exact wording matters for safety or law. Q3: check the primary source, and cite the correction. Q4: any full-sentence claim is an improvement.

Marking guidance

A strong Part 1 records fears and rules in the stakeholders' own words. A strong Part 2 frames the same engineering differently for each audience without changing the facts. A strong Part 3 puts the decision in the first sentence and shows rehearsal changing the talk. The three parts total 40 marks.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. "Listen first and make proposals only when absolutely pressed" (pp. 49–50) sits well beside the research on first offers (Galinsky and Mussweiler, 2001): listen first to learn what the other side values, then decide whether to anchor. Students can use both.
2. The Vestron negotiation (pp. 50–51) shows patience paying off; ask students what they would watch for to know whether a counterpart will keep bidding.
3. The twenty-minute guideline for speeches (p. 131) is a sound rule of thumb for talks; technical reviews often run longer, and keep to its spirit through structure.

None undermines his argument, and spotting them models the habit of checking sources.

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University of Ottawa
Faculty of Engineering — Capstone Design Program

Success as an Engineer — Professional Practice Series

Lecture 5

People, Politics and Resilience

Working with difficult people without becoming one

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Build That Kept Breaking (computer engineering)
Year:	2026



people, politics — and a steady line underneath

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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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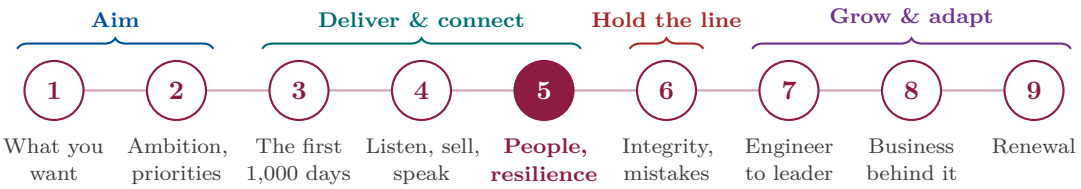
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Chapter 1

About This Lecture



Engineering is done by people, and people disagree, compete and sometimes behave badly. Most new engineers expect the hard part of the job to be technical. Many find that the hardest weeks of their first years involve a colleague: a peer who undermines them, a review that feels like an attack, a team that calls itself a family until it doesn't. This lecture is about working through those weeks without being knocked off course, and without becoming the problem yourself.

Learning objectives

By the end of this lecture you will be able to:

- **Distinguish** healthy organisational politics from undermining, and explain what the research says about the cost of each.
- **Separate** what happened from the story you tell about it, and use the two phrases Zelnick adopted to respond to a difficult peer.
- **Keep** a technical disagreement technical, using the evidence on task and relationship conflict.
- **Decide** how to respond when someone acts badly: forgive, reconcile, keep your distance or escalate — and recognise when a situation is harassment rather than politics.
- **Explain** why not needing to be liked is different from not caring whether you are liked, and what the evidence says about likeability at work.
- **Build** your *Working Relationships Plan*: three short parts, built across the chapter assignments, for a real working relationship on your capstone or co-op.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: the chapters "When Someone Acts Badly", "If It Isn't Personal, Don't Take It Personally" and "Not Everyone Will Like You, and That's Okay", and his short rules on everyday conduct.

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: their advice on getting off to the right start, learning the corporate culture, the organisational grapevine and the engineer's disadvantage in politics.

Research, mostly peer-reviewed, tests both, on organisational politics, conflict, incivility, forgiveness, likeability and resilience.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Working Relationships Plan

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Nadia's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Working Relationships Plan**, for one working relationship on your capstone or co-op that is harder than it should be: Part 1 (an incident log and a politics map, due at the end of week 1), Part 2 (a response plan, due at the end of week 2) and Part 3 (a steadiness plan with a two-week log, due at the end of week 3). Keep the other person's identity out of anything you submit.

Chapter 2

Case Study: The Build That Kept Breaking

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Wednesday 3 March 2027, 11:15 p.m.

Nadia Okafor, an engineering intern (EIT) at Corvel Networks in Kanata, Ontario, sat at her kitchen table with her laptop open and a message from her manager on the screen: “Can we talk Friday at 10? Just us.” That afternoon, in front of the whole firmware platform team, she had raised her voice at a senior colleague. He had raised his first. She was not sure that would matter.

Nadia had joined Corvel nineteen months earlier, after a computer engineering degree and two co-op terms in build and test automation. Corvel makes enterprise routers. Its firmware is built every night by a system of shell scripts, Makefiles and a Jenkins server that Kevin Lalonde, a senior engineer with nine years at the company, had written in 2018 and had kept running ever since. A full build took 94 minutes, and two builds of the same source code never produced identical images.

2.2 The assignment

In January the platform team’s manager, Sanjay Mehta, gave Nadia the lead on replacing it. Corvel’s largest customer, Tessera Telecom, had made reproducible builds and a software bill of materials (SBOM) a condition of its next security audit, due on 30 June. Sanjay wanted a containerised pipeline, a nightly build under 30 minutes and bit-identical images from the same commit. Kevin learned about the project in the same meeting as everyone else. Two weeks later he reviewed her first merge request (Exhibit 1).

Exhibit 1 — Kevin’s review of Nadia’s first merge request, 26 January (extract)

1. “Did you actually read the old Makefile before deciding to throw it away?”
2. On a change to the pinned compiler version: “This is how new grads break things. Blocking.”
3. “Your cache keys are wrong. They have to include the kernel headers, or you will ship stale objects. See my 2021 wiki page.”
4. On approving the request after Nadia’s changes: “LGTM, I guess. Your funeral.”

Nadia’s note in the margin: *He’s right about 3. I checked. I hate that he’s right about 3.*

Exhibit 2 is Nadia’s own record of the two months that followed the announcement.

Exhibit 2 — Nadia's timeline, January to March 2027

Date	What happened
Mon 11 Jan	Sanjay announces the migration, with Nadia as lead. Kevin says nothing.
Tue 26 Jan	Kevin reviews Nadia's first merge request (Exhibit 1, above).
Tue 9 Feb	At stand-up Kevin says, "The new pipeline broke nightly again." It is the third time he has said so.
Fri 12 Feb	A teammate, Priya Nair, tells Nadia that Kevin told the director of engineering, Anne-Marie Roy, that the migration is "a junior project that's going to cost us the Tessera audit".
Thu 18 Feb	Kevin holds a meeting on the build-cache servers. Nadia is not on the invitation.
Mon 1 Mar	In the team's private `#lunch-crew` chat Nadia writes: "Kevin is a dinosaur guarding his little kingdom. Counting the days till he retires." That evening someone sends a screenshot to Kevin.
Wed 3 Mar	At the sprint retrospective Kevin, loudly: "Some of us have kept this build alive for nine years." Nadia, as loudly: "Maybe if your tests weren't flaky it would stay alive on its own." Silence. Sanjay ends the meeting early.

2.3 The numbers

Since 18 January the new pipeline had run every night from Nadia's branch, alongside the old one. Failed builds appeared in the team channel as "nightly: FAILED", with no cause. On 2 March Nadia went through the logs herself (Exhibit 3); nobody else had seen the result.

Exhibit 3 — The 44 nightly builds, 18 January to 2 March 2027

Item	New pipeline	Old system
Failed builds	16	13
caused by flaky packet-forwarding integration tests[a]	10	10
caused by errors in the new pipeline's configuration	3	—
caused by the build farm running out of disk	2	2
caused by an upstream toolchain update	1	1
Median build time (minutes)	31	94
Test rebuilds of one commit that were bit-identical	18 of 20[b]	0 of 20

[a] The packet-forwarding test suite is maintained by Kevin; the same tests fail on both systems. [b] The two mismatches occurred when a third-party library was rebuilt rather than restored from cache, embedding a new timestamp.

2.4 Wednesday night

Nadia opened a text file and wrote down what she was thinking (Exhibit 4). On her phone was a recruiter's message from Monday about a build-engineering role at a cloud company in Ottawa.

Exhibit 4 — Nadia's notes, 3 March, 11:30 p.m.

- I have been nice to everyone since the day I started. Why is this happening to me?
- Priya says Kevin applied for the team-lead job two years ago. Sanjay got it. Sanjay then gave Kevin's system to me.
- Options for Friday: (a) give Sanjay the full list of everything Kevin has done; (b) ask Sanjay to take Kevin off my reviews; (c) apologise for the retro and say nothing else; (d) call the recruiter back.
- I need Kevin to like me. Nobody knows the old build like he does, and I can't hit 30 June without him.
- I've been checking the team channel at midnight every night since the screenshot.

Nadia had until Friday at 10.

Discussion questions

Before reading further, write a short answer to each question.

1. Which of Kevin's comments in Exhibit 1 contain engineering content worth keeping?
2. Sort the entries in Exhibit 2 into three groups: things Nadia saw herself, things she was told, and interpretations.
3. What does Exhibit 3 change, and what does it not change?
4. What did Nadia contribute to the escalation?
5. Which of the options in Exhibit 4 would you choose, and what would you say in the first two minutes on Friday?

We return to Nadia in Chapter 6.

Chapter 3

If It Isn't Personal, Don't Take It Personally

3.1 Two kinds of politics

Zelnick's argument

"Probably that which most people find least appealing about professional organizations is what we generally refer to as 'politics.' Certain political activities, such as negotiating and compromising, are crucial for organizational effectiveness — and therefore are largely healthy. But most people don't mean that when they describe politics. They usually mean talking behind other's backs, undermining other's credibility and casting doubt on other's effectiveness in order to obtain a competitive advantage" (pp. 72–73).

His prescription: "one's *experience* of political behavior (as distinguished from the behavior itself, which often cannot be controlled or even influenced) *can* be neutralized by not taking it personally. This means recognizing that someone else's politics usually are driven by — and reflect — his or her own goals, needs, desires and personality traits" (p. 73).

Zelnick draws the line between the two kinds of politics by motive and method. Negotiating and compromising happen in the open and serve the organisation. Undermining happens out of sight and serves the person doing it. Figure 3.1 turns that distinction into a map and places the events of Exhibits 1 and 2 on it. Note where Nadia's own message lands.

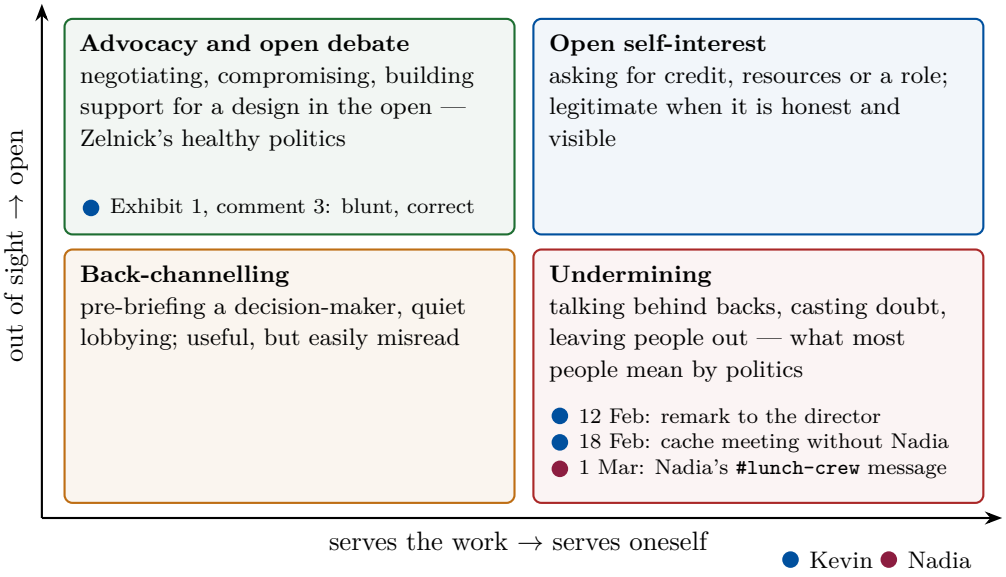


Figure 3.1: A map of organisational politics built from Zelnick's distinction (pp. 72–73), with events from Exhibits 1 and 2 placed on it. Positions are judgements. The point of the map is that both people in the case have acted in the bottom-right quadrant.

What Morse, Schell & Babcock add: the engineer and the organisation

Morse, Schell & Babcock open their advice on starting a career with the French engineer and executive Henri Fayol, writing in 1916: "the engineer accomplishes but little without other people's assistance, even when [they] start out. To learn how to handle [people] is a pressing necessity" (Morse et al., 2020, p. 362). They tell new engineers to "learn the corporate culture": "Notice how your more effective colleagues interact and how they get things accomplished" (Morse et al., 2020, p. 364). And they warn that "the engineering mind-set can be a disadvantage in top-level politics", quoting a columnist on President Jimmy Carter, an engineer who treated governing as problem-solving and "did not react well when legislators tinkered with his solutions" (Morse et al., 2020, p. 382). Their description of the *grapevine*, an organisation's informal communication system, fits the case: it carries "information and rumors (both true and false)" from employee to employee, and effective managers "make sure that factual information is published by official means to moderate transmission of misinformation" (Morse et al., 2020, p. 371). Priya's report and the forwarded screenshot both travelled by the grapevine; Exhibit 3 is the kind of fact that should travel officially.

What the research says: politics costs people, political skill pays

- **Perceived politics is a strain.** A meta-analysis found that employees who see their workplace as highly political report more strain ($r = .48$) and stronger intentions to quit ($r = .43$), and lower job satisfaction ($r = -.57$) and commitment ($r = -.54$); their task performance is somewhat lower too ($r = -.20$) (Chang et al., 2009).
- **Political skill is a skill.** Ferris et al. (2005) define it with four measurable dimensions: social astuteness, interpersonal influence, networking ability and apparent sincerity. A later meta-analysis found political skill related to task performance even after allowing for personality and general mental ability, and to job satisfaction, career success and reputation (Munyon et al., 2015).

The two findings fit Zelnick's distinction. A workplace that feels political is a worse place to work; the open, honest kind of influence is part of doing the job well.

3.2 "That's the wrong emotion"

Zelnick's argument

At BMG, Zelnick arrived in a role that put him "in competition with, and therefore threatening to" a senior German executive he calls Mark, who was experienced in the record business and well regarded at the parent company. "Mark immediately started gunning for me. He tried to block my initiatives and my decisions, he criticized me behind my back, he complained to our boss about me and, generally speaking, did whatever he could to ensure that I'd fail" (pp. 73–74).

Zelnick went to the head of human resources, Joe Isenstein. "Joe said, 'You look like you're about to cry.' And I replied, 'Well, it's really hurtful.' Joe sat back in his chair and studied me. At last he responded, 'That's the wrong emotion. You shouldn't feel hurt; you should

be angry.’ ” Zelnick came to see that Mark’s behaviour “had nothing to do with me. It had to do with the role I was in and the fact that Mark experienced me as a threat” (pp. 74–75).

What changed first was Zelnick’s response, not Mark. He worked around Mark and stayed calm in their confrontations: “the more calm I remained, the more control he lost”, and in time Mark “began to back off” (p. 75). With a coach, Gloria Henn, he adopted two phrases. The first is a question, “What’s that all about?”, which “forces the other person to take responsibility for, and explain, his or her behavior”. The second is “That doesn’t work for me”, “a firm statement that one will not accept, or engage in, negative interactions” (pp. 75–76). “Ultimately I was promoted over him, and he left the company” (p. 76).

He contrasts this with his earlier years under Barry Diller at Twentieth Century Fox, whose weekly meetings were famously rough. Executives who “took Barry’s trademark style personally” failed and left; those who treated the meetings as “robust, challenging (if sometimes loud and unpleasant) debates” learned a great deal (p. 77). Diller was direct; Mark was devious.

Joe Isenstein’s advice separates two things that feel like one: what happened, and the story you tell yourself about it. Table 3.1 applies that separation to three events from Nadia’s timeline.

Table 3.1: Separating what happened from the story about it, for three events in Exhibit 2. The “role-based reading” is Zelnick’s alternative to taking it personally.

What happened	Personal story	Role-based reading	A response
9 Feb: “The new pipeline broke nightly again.”	He wants me to fail.	The system he built is being replaced by a junior colleague’s; failures look like proof that it shouldn’t be.	Publish the cause of every failed build (Exhibit 3).
12 Feb: remark to the director, reported by Priya	He is trying to get me removed.	Second-hand; he may fear the audit, the change or both.	Ask him directly and privately: “What’s that all about?”
18 Feb: cache meeting without Nadia	He is freezing me out.	He still thinks of the cache as his.	“Leaving me off the cache design doesn’t work for me. Can I join the next one?”

Engineering translation

For an engineer, not taking it personally has a practical meaning: *move the argument onto evidence*. Kevin’s claim that the pipeline keeps breaking is a claim about data, and Exhibit 3 answers it better than any conversation could. Reporting the cause of each failure automatically would take most of the heat out of the argument. And a code review is the natural place for “That doesn’t work for me”: “A review comment about my competence rather than the code doesn’t work for me. Tell me what’s wrong with the change and I’ll fix it.”

3.3 Keep technical conflict technical

Kevin and Nadia's quarrel began as an engineering disagreement: whether the old build should be replaced, how the cache should be keyed, whose tests were failing. By March it was about each other. Research on teams distinguishes *task conflict*, over the work, from *relationship conflict*, over personalities and values.

Myth check: "A bit of conflict is always good for a team"

Engineers are often told that disagreement about the work improves decisions, so long as it stays professional. The evidence is less comfortable. An early meta-analysis found that task conflict and relationship conflict were *both* associated with lower team performance and satisfaction, contrary to the prediction that task conflict would help (De Dreu and Weingart, 2003). A larger one, covering 116 studies and 8,880 groups, found stable negative associations between relationship conflict and group outcomes but no strong negative association for task conflict. Task conflict was more positive when it was only weakly correlated with relationship conflict, in top-management teams, and when performance was measured as financial results or decision quality (de Wit et al., 2012). Conflict about the work *can* help, but only if it stays about the work.

How does a disagreement over cache keys become two people shouting at a retrospective? Andersson and Pearson (1999) describe workplace *incivility* as low-intensity deviant behaviour with an ambiguous intent to harm, such as a sarcastic comment or an exclusion. They propose that it can spiral: each side answers perceived disrespect with a little more, until a tipping point turns it into open hostility. Figure 3.2 traces Nadia and Kevin's spiral.

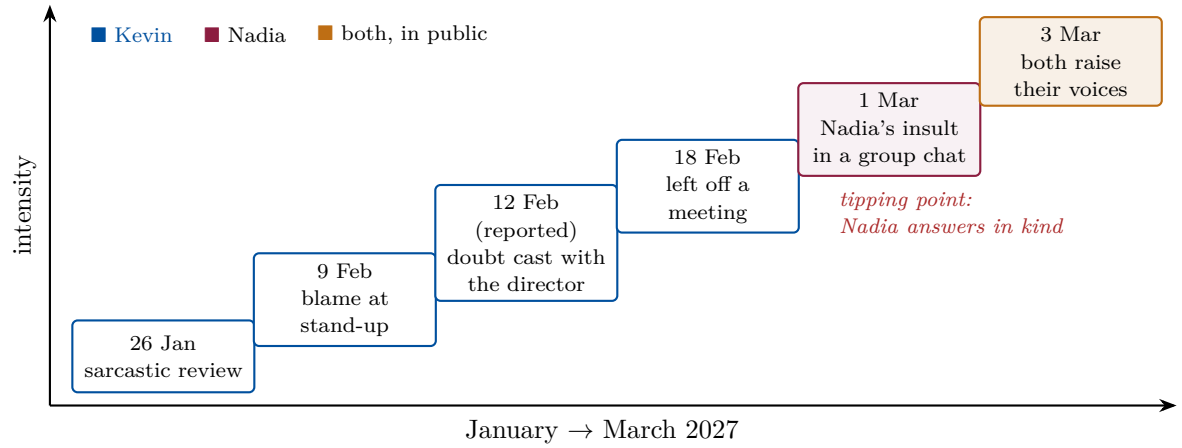


Figure 3.2: The escalation in Exhibit 2 drawn as an incivility spiral (Andersson and Pearson, 1999). Each step is small on its own; the spiral turned into open conflict when Nadia replied in kind. Heights show relative intensity, not a measurement.

A spiral can be broken at any step, by either person. The cheapest place is early and private: one conversation on 26 January about the review comments would have cost less than anything that followed.

When it is not politics

Not taking things personally is advice for rivalry, rudeness and competition. It is not advice to absorb harassment or discrimination. In Ontario, the *Occupational Health and Safety Act* defines workplace harassment as a course of vexatious comment or conduct against a worker in a workplace, including virtually, that is known or ought reasonably to be known to be unwelcome, or workplace sexual harassment (s. 1(1)). It also says that reasonable actions by an employer or supervisor to manage and direct workers are not harassment (s. 1(4)). Employers must have a harassment policy and program and must investigate incidents and complaints (ss. 32.0.1, 32.0.6, 32.0.7) (Occupational Health and Safety Act, 1990). Other provinces and countries have their own rules. If what is happening fits a definition like this, use the reporting channel your employer is required to have. That is not taking it personally; it is what the channel is for.

Most friction never comes near that line, and small habits keep it there.

Capstone move

Look at the last three review comments you wrote on a teammate's work. Rewrite any that comment on the person rather than the change. Then pick one disagreement on your team this week and ask the other person, privately and with curiosity, what is behind their position.

Discussion questions

1. Zelnick says other people's political behaviour "often cannot be controlled or even influenced" (p. 73). Is that true of Kevin's behaviour? What could Sanjay control that Nadia cannot?

2. Joe Isenstein told Zelnick to feel angry rather than hurt. What does anger make possible that hurt does not, and what are its risks?

3. Zelnick thrived under Barry Diller and struggled with Mark. Is "don't take it personally" easier with a direct opponent than a devious one? Why?

4. Where on Figure 3.1 would you place pre-briefing the director before a design review? When does it move to the bottom-right quadrant?

Assignment — Incident log and map (Working Relationships Plan, Part 1)

Task.

1. Choose one working relationship on your capstone or co-op that is harder than it should be. Refer to the other person by role only ("teammate A", "supervisor").
2. Log three recent incidents in a table like Table 3.1: what happened (only what you saw or heard yourself), your personal story, a role-based reading, and a possible response.
3. Place the three incidents, and one thing *you* did, on a map like Figure 3.1, with a sentence justifying each position.
4. Identify which part of the friction is task conflict and which is relationship conflict, and propose one step that keeps the task conflict about the task.

Deliverable and due date. Two pages (PDF), due at the end of week 1.

Marking (10 marks).

- *Incident log* (4): one mark per incident with facts clearly separated from story and a concrete response, plus one if every role-based reading is plausible and specific.
- *Politics map* (3): all four items placed and justified, including your own (3); your own item missing, or some justifications weak (2); placed without justification (1); missing (0).
- *Conflict analysis* (3): task and relationship conflict clearly separated, with a concrete step (3); separated, step vague (2); not separated (1); missing (0).

Chapter 4

When Someone Acts Badly

4.1 Forgiveness is for the person who forgives

Zelnick's argument

At BMG, a business partner Zelnick calls Seymour, whom many in the music business had warned him not to trust, used a contractual loophole to sign one of BMG's major acts to his own label (p. 69). Zelnick accepts his own "(numerous) errors": he had projected his own view of the world onto Seymour, ignored better-informed advice and failed to protect the company. Still, "the fact that a business partner would act this way basically made my head explode" (p. 70).

A fellow university trustee, Bob Thompson, a school chaplain, asked what was wrong. " 'I feel betrayed, and I can't let it go.' Bob responded thoughtfully, 'You have to forgive him.' I was stunned. Bob continued, 'This isn't about him. It's about you. Once you forgive him, you can move on' " (p. 70). Some weeks later Zelnick and Seymour had lunch and agreed to let the past go. "I never again unthinkingly or unknowingly projected my ethical standards onto someone else. But I did forgive him. And a weight was lifted" (p. 71).

"Holding onto anger and disappointment isn't useful — and it chips away at one's soul. As my friend Larry Poland says, it's like eating rat poison and hoping that the rat will die. ... The best revenge is to move ahead productively while the other party is stuck being the kind of person who would do what he or she did" (p. 71).

Two parts of the story are easy to miss. Zelnick forgave Seymour, but he also changed how he worked: he stopped assuming that others shared his standards. And he did both after taking responsibility for his own mistakes. Forgiveness, in his account, is not the same as trust, and it is not the same as pretending nothing happened.

What the research says: what makes forgiveness more likely

- **The situation matters more than the person.** A meta-analysis of 175 studies and 26,006 participants found that people forgive more when they feel empathy for the offender ($r = .51$) and when the offender apologises ($r = .42$), and less when they see the harm as intended ($r = -.49$) or feel angry ($r = -.41$). Features of the situation explained more than personality did (Fehr et al., 2010).
- **Fair systems change who forgives.** In a field study of employees' responses to offences at work, the organisation's *procedural justice climate* changed how status played out. Where procedures were seen as fair, higher-status victims were more likely to forgive and reconcile; where they were not, victims who outranked the offender were more likely to seek revenge (Aquino et al., 2006).

Both findings support Zelnick and add something he does not say. An apology from the person who caused the harm makes forgiveness easier, and the fairness of an organisation's procedures shapes who forgives and who seeks revenge. Zelnick's account mentions no apology from Seymour. In the case, Nadia is in a position to offer one to Kevin.

Aquino et al. (2006) describe four ways people respond to an offence at work: revenge, avoidance, reconciliation and forgiveness. Forgiveness is an internal change, letting go of resentment; reconciliation is an external one, restoring the working relationship. Figure 4.1 separates the two.

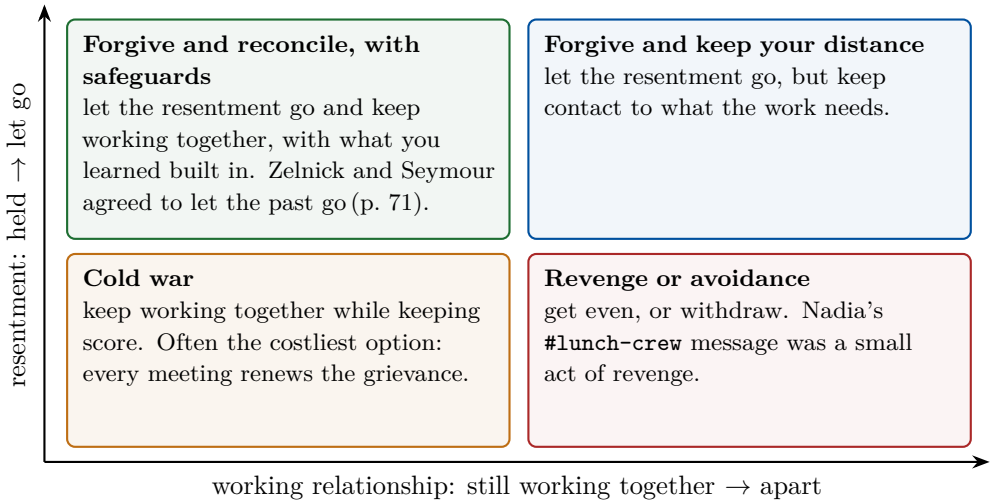


Figure 4.1: Forgiveness (letting go of resentment) and reconciliation (continuing to work together) are separate choices, after the responses to offences described by Aquino et al. (2006). Engineers who must keep working with someone usually aim for the top-left.

Myth check: "Venting gets it out of your system"

The idea that expressing anger drains it away, called *catharsis*, is old and popular. In a classic test, angered participants hit a punching bag while thinking about the person who had provoked them, hit it while thinking about getting fit, or did nothing. Those who vented while thinking about the provoker were the angriest and the most aggressive afterwards; doing nothing worked better than venting (Bushman, 2002). Nadia's message to `#lunch-crew` did not get Kevin out of her system. It put him at the centre of it and handed him a grievance of his own.

4.2 Not everyone will like you

Zelnick's argument

"It's crucial to distinguish between being liked or likable as something that's nice to be, and as attributes we must have in order to succeed. In fact, there are times when effective professional behavior isn't especially friendly or likely to induce friendship" (p. 80).

As a young man Zelnick deliberately became "less outspoken and much friendlier and the world opened up to me". He later concluded that this worked "not for the reason I'd

thought … I'd simply become less threatening and irritating" (p. 81). But being liked "became a heavy, anxiety-provoking burden". With help he realised "that being trusted, respected and maybe even admired were all appropriate goals for someone who wants to lead others, but being liked was not — it was beside the point" (p. 82). "Letting go of the need … to be liked has freed me to be myself, and to make unpopular decisions when called upon to do so" (p. 82).

He quotes Abraham Lincoln on criticism: "If the end brings me out all right, what's said against me won't amount to anything. If the end brings me out wrong, ten angels swearing I was right would make no difference" (p. 83). He also tells a story about Robert E. Lee, which he calls possibly apocryphal: Lee praised a subordinate who had criticised him, explaining, "You asked me what I thought of him, not what he thought of me" (p. 84).

What the research says: why being pleasant pays, and needing approval does not

In a study of about 10,000 work relationships in five organisations, Casciaro and Lobo (2005) found that people chose whom to work with more for likeability than for ability: faced with a "competent jerk" and a "lovable fool", they tended to go to the lovable fool. Being liked affects who asks for your help, who shares information with you and who wants you on their project.

The evidence and Zelnick point the same way. His own story is of becoming more pleasant, not less; what he gave up was the *need* to be liked by everyone. The distinction matters for an engineer because the need to be liked shows up as technical decisions. Table 4.1 gives examples.

Table 4.1: How the need to be liked shows up in engineering work, and the alternative Zelnick describes: decent, clear and not dependent on approval.

Situation	Driven by the need to be liked	Decent and clear
Reviewing a senior colleague's code	Approve a change you have doubts about, to avoid friction	Block it with a specific, courteous reason and an offer to pair on the fix
A design you think is wrong	Stay quiet in the review; complain afterwards	Say so in the review, with evidence, and accept the decision once it is made
A schedule you cannot meet	Say "should be fine"	Give the date you believe, and what would change it
A colleague who dislikes you	Try harder to win them over	Be courteous, do the work well, and let the relationship follow

Nadia's note, "I need Kevin to like me" (Exhibit 4), confuses two things. She needs Kevin's knowledge and his cooperation on the cache and the flaky tests. She does not need him to like her, and trying to earn his liking would push her toward the left-hand column of Table 4.1. What she needs is his respect for her work, and Exhibit 3 is a better route to that than friendliness.

4.3 Work isn't your family

Zelnick's argument

"It's important to be especially careful when someone describes a professional atmosphere as 'family like,' or an organization as one big happy family" (p. 77). Early in his executive career Zelnick made close friends at work and "created no boundaries"; he was later asked to fire someone he had recruited, and had to fire a friend who was staying in his guest room at the time (p. 78). "Work isn't your family, and thinking of it as such can make a job unclear, complicated and risky. ... I'm not suggesting that you avoid congenial relationships at work. I am suggesting that you keep deep and intimate bonds separate from the office. It may seem hard-hearted, but I think it's a necessary and appropriate boundary that will serve you well" (p. 78).

Engineering translation

The `#lunch-crew` channel is a small version of Zelnick's warning. It felt like a group of friends, so Nadia wrote in it as she would to friends. But everyone in it was also a colleague of Kevin's, and one of them forwarded the message. For an engineer the rule is simple: *anything typed in a work tool is a work record.* Keep friendships at work; keep grievances out of work channels.

What the research says: friendships at work are a mixed blessing

In two field studies of insurance, restaurant and retail employees, people with more coworkers who were also friends received higher performance ratings from their supervisors, through greater trust and positive feeling. The same friendships also took effort to maintain and were linked to emotional exhaustion, which partly offset the gain (Methot et al., 2016). The evidence supports Zelnick's middle path: keep the friendships, and manage what they cost.

Capstone move

Think of one teammate whose approval you find yourself seeking. Name one decision this week — a review, an estimate, a design point — where you will say what you think, courteously, and let the relationship take care of itself.

Discussion questions

1. Bob Thompson said forgiveness "isn't about him. It's about you" (p. 70). Is that advice harder to follow when the other person has not apologised? What does Fehr et al. (2010) suggest?
2. Where on Figure 4.1 should Nadia aim with Kevin? What would have to happen for her to get there?
3. Zelnick says being liked is "beside the point" for a leader (p. 82); Casciaro and Lobo (2005) found that people choose likeable colleagues. Can both be true?
4. Your capstone team is also your friendship group. What boundaries, if any, would you set?

Assignment — Response plan (Working Relationships Plan, Part 2)

Task. For the relationship you chose in Part 1:

1. Decide where you want to be on Figure 4.1 in two months, and explain why.
2. Write out the private conversation you would have using "What's that all about?": your opening, two questions, and how you would respond to the most likely answer.
3. Write two "That doesn't work for me" statements for specific behaviours, each with the alternative you are asking for.
4. Identify any apology you owe, however small, and draft it in two sentences.
5. Name two decisions you have avoided or softened because you wanted to be liked, and what you would do instead (Table 4.1).

Deliverable and due date. Three pages (PDF), due at the end of week 2.

Marking (15 marks).

- *Target position* (2): a position with a reason tied to the work (2); a position without a reason (1); missing (0).
- *Conversation* (5): curious, specific and private, with a realistic response to the likely answer (5); one of these four weak (4); two weak (3); three or more weak (2); accusatory (1); missing (0).
- *Boundary statements* (3): two statements, each about behaviour and with an alternative (3); one of them without an alternative (2); about the person rather than the behaviour (1); missing (0).
- *Apology* (2): specific and unqualified, or a reasoned case that none is owed (2); qualified ("sorry if…") (1); missing (0).
- *Need to be liked* (3): two concrete decisions with alternatives (3); one (2); generic (1); missing (0).

Chapter 5

Staying Steady

5.1 Everyday conduct prevents most of it

Near the end of his book Zelnick lists a set of personal rules. Three of them bear directly on this lecture, because each prevents a small incivility from starting a spiral like Figure 3.2.

Zelnick's argument

Offer courtesy, especially to those who can't demand it. "Is it really that hard to start every exchange with the phrase, 'How are you?' and then to pause and hear the answer?" (p. 150)

Don't talk behind others' backs. At Columbia Pictures Zelnick started at the same time as a colleague he calls James, whose voice irritated him and whom he might once have criticised behind his back. "I forced myself to see only the good in James. … I actually came to like James. He in turn became a supportive colleague and helped me to succeed at Columbia" (pp. 151–152). His test: "if I'm going to talk about people when they're not around, I'd be comfortable if they heard what I said — even if it's negative" (p. 152).

Don't raise your voice. In his first assignment at Columbia, Zelnick found that a longtime employee he calls Joe had not finished a job. "At that point, I lost it and yelled at him" (p. 153). "Despite my sincere apologies, for the rest of the time we worked together, Joe never looked at me in the way he had before I'd yelled at him. … In the decades since I've probably raised my voice fewer than five times — and I'm not proud of any of them. A calm approach not only builds trust and protects relationships, it's also usually more effective. High-pressure communication never, ever helps" (p. 154).

What the research says: why small conduct matters

- **Incivility is common.** In the authors' polling of workers over 14 years, 98% reported having experienced incivility at work (Porath and Pearson, 2013).
- **Not all gossip is the same.** People gossip for four main reasons: to gather and check information, for enjoyment, to influence others negatively, and to protect the group from someone who breaks its norms. In student samples, gossip about a norm-breaker that was attributed to protecting the group was not disapproved of (Beersma and Van Kleef, 2012).
- **Safety to speak up supports learning.** In a study of 51 teams in a manufacturing company, *psychological safety*, "a shared belief held by members of a team that the team is safe for interpersonal risk taking", was associated with learning behaviour, and learning behaviour mediated its link with team performance (Edmondson, 1999). Shouting at a colleague in front of the team is one obvious way to erode it.

The gossip finding refines Zelnick's rule rather than overturning it. Telling a supervisor that a colleague is skipping safety checks is talk behind someone's back, and it can be the right thing to do. Zelnick's comfort test still works: you should be able to stand behind it if they hear it.

Figure 5.1 turns Zelnick's test and the gossip research into a check to run before you talk about an absent colleague.

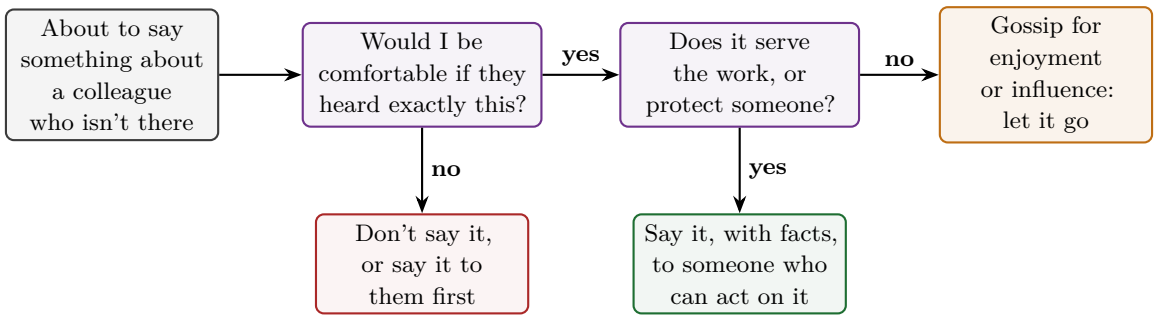


Figure 5.1: A check before talking about a colleague who is not present, combining Zelnick's comfort test (p. 152) with the motives for gossip identified by Beersma and Van Kleef (2012). Checking a fact with a colleague passes the second question because it serves the work. Nadia's `#lunch-crew` message fails the first question.

5.2 Resilience is ordinary

Zelnick does not claim that any of this came easily. "It took me a very long time to learn how not to take things personally, and it certainly wasn't easy. Now I'm pretty good at it. Some would say I'm too good at it and that I can appear cold or distant. But there's no doubt that I'm much more effective" (p. 79). And he manages what reaches him: "I take pains to place strict limits on the occasions and circumstances that might trigger emotional feelings in a business setting. For example, I avoid reading negative press about myself" (p. 83).

Myth check: "Resilience is a rare trait: you either have it or you don't"

Resilience is often described as a special toughness that some people are born with. Research on children growing up in adversity concluded the opposite: resilience "is common" and "usually arises from the normative functions of human adaptational systems", made of "ordinary rather than extraordinary processes" (Masten, 2001). Among adults facing loss or potentially traumatic events, resilience is also more common than was believed, is distinct from recovery, and has several pathways (Bonanno, 2004). A difficult colleague is not a trauma, but the lesson carries over: steadiness is built from ordinary habits that can be learned, as Zelnick says he learned them.

One of those habits is *reappraisal*: changing how you interpret a situation, rather than suppressing the feeling it produces. People who habitually reappraise report more positive and less negative emotion, better relationships and higher well-being; habitual suppression shows the reverse pattern (Gross and John, 2003). Reappraisal also changes the body's response. Participants who were told, before a stressful public-speaking task, that a racing heart helps performance showed more efficient cardiovascular responses and paid less attention to threatening information than two control groups (Jamieson et al., 2012).

Joe Isenstein's "That's the wrong emotion" was a reappraisal. So is Zelnick's role-based reading of Mark. Figure 5.2 applies the same move to the stand-up on 9 February.

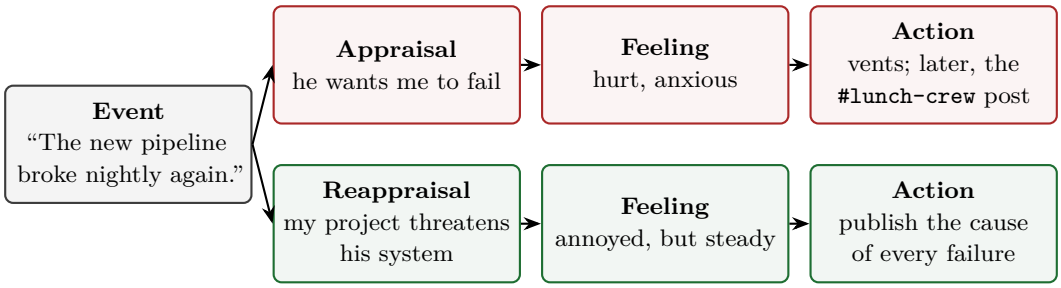


Figure 5.2: The same event, appraised two ways. The event does not change; the appraisal, and therefore the feeling and the action, does. The top row is what happened in the case; the bottom row is a reappraisal in the sense of Gross and John (2003).

5.3 Switching off, and staying connected

Zelnick's rule about negative press has a counterpart in research on recovery from work. *Psychological detachment* — mentally switching off from work outside working hours — is consistently linked with lower strain and better well-being, and high job stressors, especially workload, make it harder to achieve (Sonnentag and Fritz, 2015). Nadia's midnight checking of the team channel (Exhibit 4) is the opposite of detachment: it keeps the conflict running all night.

What Morse, Schell & Babcock add: four connections that keep people going

Discussing engineers who work as independent contractors, Morse, Schell & Babcock summarise research on what separates those who thrive from those who do not. Besides "produce or perish", the list is a connection to place (a defined workspace), to routine, to purpose, and to people, including "networks and relationships with mentors". A sense of why the work matters "provides resiliency when downturns happen" (Morse et al., 2020, p. 368). The list was written about gig workers, but it applies to anyone going through a hard stretch at work.

2026 context: always-on channels

By 2026 much of the friction between engineers happens in writing: in code review, chat and tickets, often read late at night on a phone. That has two consequences. Written remarks are permanent and easy to forward, as Nadia found. And the channel follows you home unless you decide otherwise. Under a 2021 amendment, Ontario employers with 25 or more employees must have a written policy on disconnecting from work (the first policies were due in 2022), defined as not engaging in work-related communications "to be free from the performance of work"; the law does not, however, require employers to create a new right to disconnect, or dictate the policy's content (Government of Ontario, n.d.). Read your employer's policy, and set your own notification hours.

Capstone move

Set two rules for your capstone team's chat this week: one hour after which you will not read it, and one test for what you post ("Would I be comfortable if the person I'm writing about read this?"). Tell your team about the first rule.

Discussion questions

1. Zelnick admits he can "appear cold or distant" (p. 79). Is that a price worth paying for not taking things personally? How would you avoid paying it?
2. When is talking about an absent colleague the right thing to do? Test your answer against Figure 5.1.
3. Zelnick yelled once at Joe, the Columbia employee, and apologised, but Joe never looked at him the same way again. What does that suggest about 3 March?
4. Which of the four connections in Morse, Schell & Babcock's list is weakest for you at the moment, and what would strengthen it?

Assignment — Steadiness plan (Working Relationships Plan, Part 3)

Task. For the relationship you chose in Part 1, during weeks 2 and 3:

1. Keep a log of at least six moments when the relationship affected you: the event, your first appraisal, a reappraisal, and what you did (as in Figure 5.2).
2. Write three conduct rules for yourself, each with a test you can apply in the moment (for example, Figure 5.1).
3. Define your detachment routine: when you stop reading work channels each day, and what you do instead.
4. Write a half-page reflection on which reappraisals worked and which rule you broke, and a one-paragraph introduction to your *Working Relationships Plan* linking Parts 1–3.

Deliverable and due date. Four pages (PDF), due at the end of week 3.

Marking (15 marks).

- *Log* (6): one mark per entry recording event, appraisal, reappraisal and action.
- *Conduct rules* (3): three rules, each with a usable test (3); two, or tests vague (2); one (1); none (0).
- *Detachment routine* (2): specific times and an alternative (2); vague (1); missing (0).
- *Reflection* (3): honest about what did not work, connected to Parts 1–2, with a plan (3); two of these (2); one of these, or generic (1); missing (0).
- *Introduction* (1): connects Parts 1–3 (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Nadia what to say on Friday; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 contains the most useful review Nadia has received.** Comment 3 found a real defect. Comments 1 and 2 wrap real concerns (the old build's history, the pinned compiler) in personal framing; comment 4 is purely personal. The framing, not the concerns, is the right target for "That doesn't work for me".

- **Exhibit 2 records what Nadia saw and what she was told, but not why.** Most entries are things she saw (the stand-up, the invitation list, the retrospective); two are second-hand (Priya's report of Kevin's remark to the director, and the screenshot being sent to Kevin). None records Kevin's reasons, and nothing is marked as interpretation. Two entries are Nadia's own contributions to the spiral (Chapter 3).

- **Exhibit 3 settles the factual argument but not the relationship.** Ten of the sixteen failures came from flaky tests that fail just as often on the old system; three came from her pipeline. The new pipeline is three times faster and nearly reproducible. None of that changes Kevin's sense of threat, her message or the raised voices, or the fact that she needs him for the cache and the flaky tests.

- **Exhibit 4 holds the key and the trap.** Priya's news about the team-lead job gives a role-based reading of Kevin's behaviour. "I need Kevin to like me" is the trap (Chapter 4). Option (a) starts a cold war, option (b) removes the reviewer who found her worst defect, and option (d) is a decision to make in daylight, not at midnight (Chapter 5).

6.2 One defensible opening

If Nadia apologises to Kevin on Thursday (Table 6.1), one defensible opening for Friday is:

> **"Before anything else: I wrote something about Kevin that I shouldn't have, and I raised my voice on Wednesday. I apologised to him yesterday. I'd like to show you what the build data actually say, and suggest how Kevin and I can split the two problems that are really his and mine: the flaky tests and my pipeline configuration."**

It takes responsibility, moves the argument onto evidence, and treats Kevin as part of the solution rather than the problem, in three sentences.

6.3 A worked plan

Table 6.1 turns the analysis into a plan for the next two weeks.

Table 6.1: One plan for Nadia's next two weeks.

When	Action	Chapter
Wednesday night	Close the laptop. Stop reading team channels after 9 p.m. for the next two weeks	5
Thursday	Apologise to Kevin privately, in two unqualified sentences, for the message and for raising her voice. Ask him what worries him about the audit, and listen	3, 4
Friday 10:00	With Sanjay: own her part first; show Exhibit 3 as data, not as a charge; propose that the nightly report names the cause of every failure, that Kevin owns the flaky-test fix with visible credit, and that she joins the cache design	3
Next two weeks	Invite Kevin to review the cache design as the expert. Answer personal review comments with "That doesn't work for me" and a request about the code. Keep an appraisal log	4, 5
Mid-March	Decide about the recruiter on the merits of the job, not as an escape	5

> **The one-sentence version of this lecture.** Separate what happened from the story you tell about it, keep technical conflict on the evidence, forgive without forgetting what you learned, and aim to be trusted and respected rather than liked — then look after the habits that keep you steady.

Glossary

Back-channelling Influencing a decision privately, for example by pre-briefing a decision-maker; legitimate or not depending on motive and openness.

Catharsis The idea that expressing anger reduces it; not supported by experiments (Bushman, 2002).

Forgiveness Letting go of resentment toward someone who has caused harm; an internal change, distinct from reconciliation (Aquino et al., 2006).

Grapevine An organisation's informal communication system, which spreads both facts and rumours (Morse et al., 2020, p. 371).

Incivility Low-intensity deviant behaviour with ambiguous intent to harm, in violation of norms for mutual respect (Andersson and Pearson, 1999).

Incivility spiral The escalation of incivility as each side answers perceived disrespect with a little more (Andersson and Pearson, 1999).

Organisational politics Activity aimed at influence inside an organisation. Zelnick separates healthy negotiating and compromising from the undermining that most people mean by the word (Zelnick, 2015, pp. 72–73).

Political skill The ability to understand others at work and influence them in ways that serve personal and organisational goals, with four dimensions (Ferris et al., 2005).

Procedural justice climate A shared perception that an organisation's procedures are fair (Aquino et al., 2006).

Psychological detachment Mentally switching off from work outside working hours (Sonnentag and Fritz, 2015).

Psychological safety A shared belief that the team is safe for interpersonal risk taking (Edmondson, 1999).

Reappraisal Changing how one interprets a situation in order to change its emotional impact (Gross and John, 2003).

Reconciliation Restoring a working relationship after an offence (Aquino et al., 2006).

Relationship conflict Disagreement about personal issues, values or personalities (De Dreu and Weingart, 2003).

Reproducible build A build that produces bit-identical output from the same source.

Resilience Adapting well in the face of adversity; common and built from ordinary processes (Masten, 2001).

Software bill of materials (SBOM) A machine-readable inventory of the components in a piece of software, in formats such as SPDX or CycloneDX.

Task conflict Disagreement about the work itself: ideas, methods, facts (De Dreu and Weingart, 2003).

Workplace harassment (Ontario) A course of vexatious comment or conduct against a worker that is known or ought reasonably to be known to be unwelcome, or workplace sexual harassment (Occupational Health and Safety Act, 1990).

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 4. Its job is to show engineering students that difficult working relationships are normal, that there are learnable ways through them, and where the line between politics and harassment lies. Materials: printed copies of Exhibits 1–3, and a board for Figure 3.1. Students may bring real situations to the discussion; remind the class that names stay out of the room, and know your institution's student support and harassment-reporting services before the session.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	In pairs, sort Exhibit 2 into seen, told and interpreted. Vote on Exhibit 4's options.
10–30	Politics	Build Figure 3.1 on the board with the class, placing Nadia's message. Read Joe Isenstein's line aloud and discuss Table 3.1. Cover the conflict myth check and the harassment note.
30–50	Acting badly	Role-play Thursday: one student as Nadia apologising, one as Kevin. Place the outcome on Figure 4.1. Discuss the likeability evidence.
50–65	Staying steady	Walk Figure 5.1 with two examples from the class; do Figure 5.2 for one student-supplied event.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); hand out all three parts of the Working Relationships Plan, since the Part 3 log runs through weeks 2 and 3 (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: comment 3 clearly; comments 1 and 2 raise real concerns under personal framing. Q2: seen — 11 Jan, 26 Jan, 9 Feb, the 18 Feb invitation, her own 1 Mar message, 3 Mar; told — 12 Feb and the screenshot; interpreted — nothing is labelled as interpretation, which is the point. Q3: see Chapter 6. Q4: the message and the raised voice. Q5: (c), extended.

Chapter 3

Q1: Nadia cannot control Kevin; Sanjay controls the failure report, the invitations and who owns the flaky tests. Q2: anger points outward and energises action; its risk is acting on it, as on 3 March. Q3: yes — a direct opponent tells you where you stand. Q4: bottom-left (back-channelling) when it informs; top-left only if the team knows it is happening; bottom-right if it aims to discredit a colleague who is not there.

Chapter 4

Q1: harder; an apology is one of the strongest correlates of forgiveness ($r = .42$), and empathy helps too (Fehr et al., 2010). Q2: top-left; an apology from her, and Kevin's credit for the tests, make it more likely. Q3: yes — Zelnick gave up the *need* to be liked, not pleasantness. Q4: agree how decisions are made and where disagreements are raised.

Chapter 5

Q1: coldness has a cost (Casciaro and Lobo, 2005); courtesy avoids it. Q2: when it protects someone or the work and goes to someone who can act. Q3: an apology may not repair it fully; prevention is cheaper. Q4: answers vary.

Marking guidance

A strong Part 1 separates facts from story and places the student's own behaviour on the map. A strong Part 2 is specific, private and curious, and includes an honest apology if one is owed. A strong Part 3 shows reappraisal changing an action at least once. The three parts total 40 marks.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. "Don't take it personally" is advice about rivalry and ordinary office politics. Harassment and discrimination are a different category and go to the employer's reporting channel (Occupational Health and Safety Act, 1990); make the distinction explicit.

2. His BMG story (pp. 73–76) is told from a senior executive's seat. A new engineer facing a difficult senior colleague can apply the same composure and should also bring in a manager early.

3. On Barry Diller's meetings (p. 77), pair his advice to not take the style personally with the research on psychological safety (Edmondson, 1999), which gives a team lead the other side of the same lesson.

4. His point that being liked is beside the point (p. 82) is about not *needing* approval; his own story is of becoming more pleasant, and Casciaro and Lobo (2005) show why that matters. Teach the two together.

None undermines his argument, and spotting them models the habit of checking sources.

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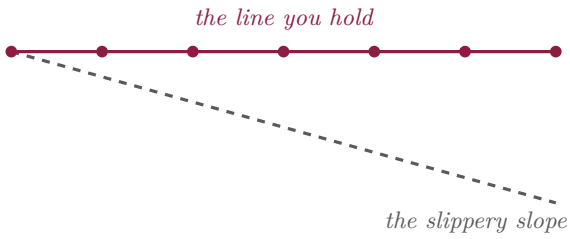
Success as an Engineer — Professional Practice Series

Lecture 6

Integrity, Truth and Mistakes

Keeping your word, your data and your nerve

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Forty-Five Samples (mechanical / automotive validation)
Year:	2026



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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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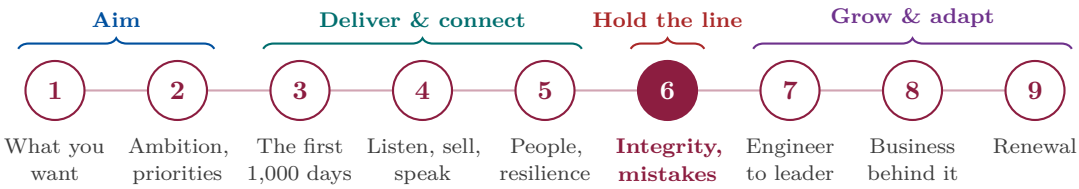
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Chapter 1

About This Lecture



Engineers are trusted with numbers other people cannot check. A test report, a calculation or a safety case is only useful if the people who rely on it can assume it is true. This lecture is about three ways that trust is kept or lost: holding a line under pressure, telling the truth when it is inconvenient, and owning your mistakes when you make them — which you will.

Learning objectives

By the end of this lecture you will be able to:

- **Recognise** the rationalisations that turn a small shortcut into a large lapse, and explain what the research says about how that happens.
- **Place** a proposed way of handling test data on a spectrum from honest to fraudulent, and say where the line is.
- **Write** a test report that states every deviation and exclusion, including your own errors.
- **Respond** to a mistake with Zelnick's three steps, a fuller apology and no blame.
- **Analyse** a failure with several contributing causes rather than a single culprit.
- **Build** your *Integrity File*: three short parts, built across the chapter assignments, drawn from your own capstone or co-op work.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: "Never Compromise Your Integrity; It's All You Have", "Tell the Truth", "Maintaining Integrity Means Making Tough Calls" and the chapters on mistakes, apology and blame.

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: reputation as the base of a career, professional registration, and integrity as a mark of engineers who go on to manage.

Research, mostly peer-reviewed, tests both. It covers unethical decisions, the slippery slope, speaking up, lying, apology, blame and error.

1.2 How each chapter is built

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary.

Reading plan (about 85 minutes) and the Integrity File

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Tomás's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Integrity File**: Part 1 (a pressure map and your own rules, due at the end of week 1), Part 2 (an honest report of results, due at the end of week 2) and Part 3 (a blameless review of one of your own mistakes, due at the end of week 3).

Chapter 2

Case Study: The Forty-Five Samples

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Tuesday 13 April 2027, 9:40 p.m.

Tomás Rivera, an engineering intern (EIT) in the validation group at Norval Motion Systems in Guelph, Ontario, had been staring at the same chamber log for twenty minutes. Norval makes electric parking-brake actuators for car and truck makers. On Friday it was due to submit the production part approval process (PPAP) package for a new actuator to its customer, Arden Motors, whose new pickup would enter production in August. The durability test at the heart of the package had finished the day before. It had not gone well, and Tomás had just found out that part of the reason was him.

2.2 The test

Tomás had joined Norval fourteen months earlier with a mechanical engineering degree. The durability test was the largest job he had run. Arden's specification required each actuator to survive 300,000 apply-and-release cycles at a chamber temperature of 110 °C. Norval tested 45 actuators and allowed no failures: with 45 passes and none failing, the test demonstrates at least 95% reliability at 90% confidence.[1] The samples ran in three chambers, A, B and C, fifteen to a chamber, for six weeks. Tomás wrote the temperature profiles. Exhibit 1 shows the result.

Exhibit 1 — Durability test summary, 1 March to 12 April 2027

Chamber	Passed	Failures (cycles at failure; teardown finding)
A	15 of 15	—
B	13 of 15	B-07 (212,000; shaft seal hardened and cracked, grease lost, clamp force below limit); B-11 (238,000; same)
C	14 of 15	C-04 (251,000; nick in the seal lip, grease lost, clamp force below limit)
Total	42 of 45	Requirement: 45 of 45

2.3 The email

On Tuesday morning the program manager, Gary Holt, wrote to the validation team (Exhibit 2).

[1] For a test with no failures allowed, the confidence C of demonstrating reliability R with n samples satisfies $1 - C = R^n$. With $R = 0.95$ and $n = 45$, $0.95^{45} \approx 0.10$, so $C \approx 0.90$.

Exhibit 2 — Gary Holt's email, Tuesday 13 April, 8:05 a.m.

Team — we can't slip the PPAP. Treat the three as fixture-related, pull three spares, run them on chamber A this week and report 45 of 45 on Friday. Arden doesn't need a science project. I don't need the details, just get it done. — G.

Tomás's manager, Dave Kowalski, the validation lead, stopped by his desk at noon. "It's Gary's program," he said. "Do what he asks and keep me out of it." Three spares could not run 300,000 cycles in four days; at twelve seconds a cycle, the test takes six weeks. Tomás did not say so.

2.4 The log

That evening Tomás pulled the chamber logs to write up the failures (Exhibit 3).

Exhibit 3 — Chamber B log and profile history (extract)

Record	Entry
Profile file, chamber B	Soak set-point 125 °C for hours 0–60, then 110 °C. Last edited Fri 26 Feb by T. Rivera
Profiles A and C	110 °C throughout
Chamber B temperature	124–126 °C for hours 0–60; 109–111 °C thereafter
Over-temperature alarm, B	Limit 130 °C; no alarm raised
Profile review	None recorded for any chamber

Tomás recognised the 125 °C set-point: it came from a profile for a different product that he had copied and edited.

The two chamber-B failures had seals that looked heat-aged. Sixty hours at 125 °C might explain them. It could not explain C-04, which had run at the right temperature all along.

2.5 Tuesday night

Tomás wrote down what he was thinking (Exhibit 4).

Exhibit 4 — Tomás's notes, 13 April, 10:15 p.m.

- Chamber B wasn't a fixture problem. It was my profile.
- If I say nothing, Gary's story covers my mistake. Nobody would ever check.
- C-04 isn't explained by anything. A nicked seal could happen on the production line.
- Options: (a) do what Gary says; (b) tell Dave about the profile and let him decide; (c) tell Gary and Dave everything tomorrow and propose a plan; (d) call Arden's supplier quality engineer myself.
- I've been here fourteen months. Gary decides who works on the next program.

The package was due on Friday.

Discussion questions

Before reading further, write a short answer to each question.

1. What exactly is Gary asking the team to do? Describe it without euphemism.
2. Does Exhibit 3 make the chamber-B failures invalid? What does it not change?
3. Why can C-04 not be treated like B-07 and B-11?
4. Which of Tomás's options in Exhibit 4 would you choose? What would you say first, and to whom?
5. What is Tomás's own mistake, and what did the system around him contribute to it?

We return to Tomás in Chapter 6.

Chapter 3

Never Compromise Your Integrity

3.1 Shortcuts that seem reasonable

Zelnick's argument

"When you're trying to get ahead, though, you're likely to find numerous integrity 'shortcuts' that may appear to be reasonable and appropriate at the time. If you're anything like me, you can find plenty of good reasons to take such a shortcut. We think: 'Everyone does it;' 'It's not that big a deal;' 'Okay, maybe I shouldn't do this, but I'll deal with it later;' 'If I don't do this, someone else will;' or 'Just this once' " (p. 52).

He believes that "many of the huge ethical lapses of our day ... began with otherwise honest people making what they initially thought were small, unimportant concessions in order to solve momentary problems" (p. 53). His guess at how the Enron collapse began ends with a chief executive telling the finance chief, "I don't want to know how you do it, just get it done" (p. 53). He calls a close variant, "I don't want to know how, just do it", "one of the most dangerous phrases in business" (p. 54). "Ethical lapses are a slippery slope — and a steep and slick one at that" (p. 54).

Gary's email (Exhibit 2) contains almost the same sentence: "I don't need the details, just get it done." Zelnick's comment on it applies directly: "You always need to know how something is done in order to ensure the actions are taken in accordance with your principles" (p. 54).

Table 3.1 lines up Zelnick's five phrases with what each might sound like in Norval's validation lab, and with the psychological mechanism that researchers call *moral disengagement*: the ways people switch off their own moral standards so that a wrong act no longer feels wrong (Moore et al., 2012).

What the research says: how honest people slide

- **Small steps make large ones easier.** Across four studies, people were more likely to commit a larger unethical act when smaller ones had come first, and moral disengagement explained the slide (Welsh et al., 2015).
- **Observers miss gradual erosion.** People were less likely to object to another person's unethical behaviour when it worsened gradually than when it changed abruptly (Gino and Bazerman, 2009).
- **Deadlines and targets add pressure.** People given specific, challenging goals were more likely to overstate their performance than people told to do their best, and most likely when they fell just short of the goal (Schweitzer et al., 2004). Forty-two of 45 is just short.

- **Euphemism hides the ethics.** Tenbrunsel and Messick (2004) describe *ethical fading*: through self-deception, including euphemistic language and the slippery slope, the ethical side of a decision drops out of view. "Treat the three as fixture-related" is a euphemism for discarding failures.

Table 3.1: Zelnick's five rationalisations (p. 52), what they might sound like in the case, and the closest mechanism of moral disengagement (Moore et al., 2012) or escalation (Welsh et al., 2015). The mappings are approximate; the last row is from Exhibit 2.

Zelnick's phrase	In the validation lab	Closest mechanism
"Everyone does it"	"Every supplier massages durability data before a PPAP."	Advantageous comparison (no worse than others)
"It's not that big a deal"	"It's three samples out of 45. The design is fine."	Distortion of consequences
"I'll deal with it later"	"We'll fix the seal quietly in the next build."	Distortion of consequences (the harm will be undone)
"If I don't, someone else will"	"Gary will get someone else to write the report."	Displacement of responsibility (the outcome happens anyway)
"Just this once"	"We never do this. The deadline is unique."	Escalation: the first step down a slippery slope
"Treat the three as fixture-related"	A failure renamed as a test problem	Euphemistic labelling

Myth check: "Ethical failures are caused by a few bad apples"

It is comforting to think that fraud is committed by bad people and that good people are safe. A meta-analysis of the sources of unethical decisions at work found otherwise: characteristics of the individual, of the moral issue itself and of the organisation all contributed (Kish-Gephart et al., 2010). Pressure, a manager's instruction and a local habit of looking away can lead ordinary engineers to do things they would never plan to do. That is exactly why Zelnick's advice is to notice the rationalisations, not to trust your character.

3.2 Where the line is

Engineers handle imperfect data every day. Samples are damaged, instruments drift and tests are run wrongly. Some ways of dealing with that are good practice; one of them is fraud. Figure 3.1 arranges the options for Tomás's three failures from the most honest to the least.

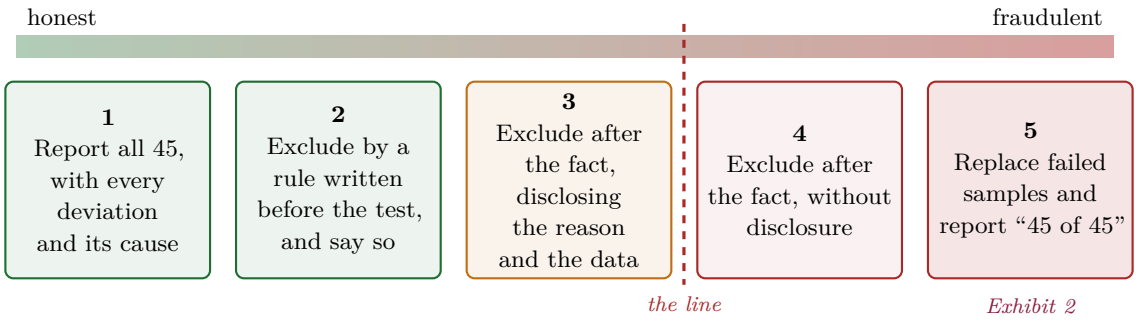


Figure 3.1: Ways of handling Tomás's three failures, from honest to fraudulent. Options 1 and 2 are good practice; option 3 is defensible only if the data are shown both ways, so the customer can judge; options 4 and 5 misrepresent the result. Gary's email asks for option 5.

Once Exhibit 3 is known, even option 3 in Figure 3.1 has limits. The chamber-B samples were tested *harder* than specified, so their failures do not prove that the design fails at 110 °C — but nor do they prove that it passes. And C-04 has no deviation to explain it at all. An honest report says 42 of 45, explains the deviation in chamber B, calls C-04 a failure, and proposes what happens next.

What Morse, Schell & Babcock add: reputation, registration and integrity

Morse, Schell & Babcock tell new engineers that "you must begin building for yourself a personal reputation on which your future career success will depend" (Morse et al., 2020, p. 362). They note that "corporations engaging in the practice of engineering legally do so only under the direction of individuals in the firm who are registered professional engineers" (Morse et al., 2020, p. 378), describing US practice; Ontario has an equivalent requirement for businesses that offer engineering services. And in a list of attributes that mark researchers who will become good managers, drawn from a senior DuPont executive, one line reads simply: "They have integrity" (Morse et al., 2020, p. 384).

In Ontario, the Code of Ethics that binds licensed engineers requires them to act with "fidelity to public needs" and "devotion to high ideals of personal honour and professional integrity", and to "regard the duty to public welfare as paramount, above their duties to clients or employers" (Professional Engineers Ontario, n.d.). A parking brake that holds a pickup on a hill is a public-welfare matter.

3.3 Integrity costs something

Zelnick's argument

At Twentieth Century Fox, a powerful Hollywood agent Zelnick calls Ted demanded that Fox pay a star $4 million that, under the deal Zelnick had structured, it did not owe. Zelnick had the authority to pay it. "I said to Ted, 'You know the deal. We don't owe [the star] any money. I'm sorry, but we can't pay it.' Ted lowered his voice almost to a whisper. He said, 'Strauss, this is *personal*.' " Zelnick was ambitious and "could not afford to lose my job". He refused again. "The call ended. I knew I'd permanently lost a key ally in the community. But I could not, and would not, make any other decision" (pp. 137–138).

Zelnick does not pretend that the honest choice was free. The call was "the last straw"; that night he told his wife it was time for him to leave the movie business (p. 138). His advice is not that integrity always pays. It is that "habitual trade-offs between integrity and achievement will ultimately define you. Never risk your reputation for fair dealing. Once it's gone you can't get it back" (p. 55).

Engineering translation

For an engineer, the most useful form of integrity is *decided in advance*. Write down, before a test starts, what counts as a valid sample, what would justify excluding one, and who must approve a deviation. Under pressure on a Tuesday night, a rule you wrote in February is much easier to follow than a principle you have to argue for.

Capstone move

Before your next capstone test or survey, write three sentences: what result counts as a pass, what would make a sample or response invalid, and what you will do if the result is a fail. Share them with your team before you collect any data.

Discussion questions

1. Which of Zelnick's five phrases in Table 3.1 have you heard on a team project? Which have you said?
2. Why is "I don't need the details" so dangerous for the person who says it, as well as for the person who hears it?
3. Place "re-run only the failed samples until they pass" on Figure 3.1. Explain your answer.
4. Zelnick lost an ally by refusing Ted. What might Tomás lose by refusing Gary, and what might he lose by agreeing?

Assignment — Pressure map and rules (Integrity File, Part 1)

Task. Choose a current capstone or co-op project that produces results someone will rely on (a test, a simulation, a survey, a calculation).

1. Identify two points where deadlines or targets could tempt someone to shade the result, and the rationalisation (Table 3.1) each would most likely use.
2. Write your pre-test rules: what counts as a valid result, what would justify an exclusion, and who must approve a deviation.
3. Place three possible ways of handling a disappointing result on a line like Figure 3.1, and mark where your line is.

Deliverable and due date. Two pages (PDF), due at the end of week 1.

Marking (10 marks).

- *Pressure points* (3): two specific points, each with a plausible rationalisation (3); one of them vague (2); generic (1); missing (0).
- *Pre-test rules* (4): validity, exclusion and approval rules, all specific enough to apply (4); one missing or vague (3); two (2); a general statement of honesty only (1); missing (0).
- *Line* (3): one mark each for placing all three options, justifying each placement, and drawing the line.

Chapter 4

Tell the Truth

4.1 Default to the truth

Zelnick's argument

"It is human nature to dissemble — at least now and then. Why? Because at least in the moment it seems easier than being completely honest" (p. 111). Zelnick describes a cousin who, now and then, bent the truth and would ask, when a story was needed, "What's our story going to be?". His own stock answer became: "I have an idea: let's default to the truth." It is now one of his firm's sayings: "When we're thinking about how best to handle a difficult issue, or what to say in a difficult situation, or how to convey difficult information, we often tell each other: 'Let's default to the truth.' Everything becomes a lot easier and clearer when we do" (p. 112).

"Accurate information is crucial to avoiding risk and creating value in any organization. Many business failures could have been avoided by the prompt exchange of accurate information" (p. 113).

Zelnick is not an absolutist. He rejects the view that you should tell your aunt you dislike her apple pie (p. 111). His rule is about business information: what happened, what the numbers are, what went wrong. That is exactly the kind of information a test report carries.

Myth check: "Everybody lies every day"

The claim that people lie constantly is often used to excuse a lie as normal. In a survey of 1,000 US adults, 60% reported telling no lies at all in the previous 24 hours, and almost half of all the lies reported were told by just 5% of respondents (Serota et al., 2010). Lying is common but not universal, and it is concentrated in a small number of prolific liars. Zelnick is right that dissembling is tempting; he is also right that a team can decide not to do it.

4.2 Culture is tested in the breach

Zelnick's argument

When his firm takes over a company, Zelnick tells its staff: "We have only one strict rule at our firm: if you lie, we'll fire you. And we mean it." "Like personal character, corporate culture is only tested in the breach" (p. 113). After an acquisition, a co-founder he calls Kirk hacked into the company's systems for confidential information, then denied it when confronted. The founder, Morris, refused to fire him. Zelnick replied, "quietly and deliberately, 'Either we fire Kirk tomorrow or I'll have to let you go' " (p. 114). Kirk

was fired; within weeks Morris told Zelnick he had been right. “Our culture of honesty mattered too much to me to overlook a breach of it, and thereby negate it, at a time that it was being directly challenged” (p. 115).

Zelnick’s story is told from the top. Most engineers meet the question from below: whether to tell a manager something the manager does not want to hear. Research on that question is sobering.

What the research says: why people stay silent, and what that costs

- **Silence is common.** In interviews with 40 employees, most described at least one occasion when they had not raised an issue or concern with their managers. The reasons they gave most often were fear of being seen negatively and of damaging relationships (Milliken et al., 2003).
- **Speaking up is a choice.** Voice is discretionary: nobody can be ordered to raise a concern they are hiding, so organisations depend on people choosing to speak (Morrison, 2014).
- **Good teams report more problems.** In a study of hospital units, the better-led units reported more medication errors. Edmondson (1996) concluded that people there appeared more willing to report errors, not that they made more.

The last finding matters for how a test result is read. A team that reports three failures and an error in its own profile is not necessarily worse than a team that reports none.

4.3 The honest test report

A test report is where an engineer’s truthfulness becomes visible. Table 4.1 lists what an honest report contains, with what that means for Tomás’s.

Table 4.1: What an honest test report contains, and what each element means for the durability test in Exhibit 1.

Element	In Tomás’s report
Requirement and pass criterion	300,000 cycles at 110 °C; 45 of 45 must pass
Every sample, including failures	All 45, with the cycle count and teardown finding for each failure
Deviations from the procedure, and their cause	Chamber B ran at 125 °C for 60 hours because of a profile error by the test engineer; no profile review was recorded
Exclusions, the rule and when it was set	None set before the test; any exclusion now is after the fact and must be shown both ways
Conclusion against the requirement	Not met: 42 of 45; C-04 failed at the specified condition
Open issues and next steps	Root cause of C-04; a retest plan and its schedule

Figure 4.1 turns the question "may I exclude this sample?" into three questions that can be answered with evidence.

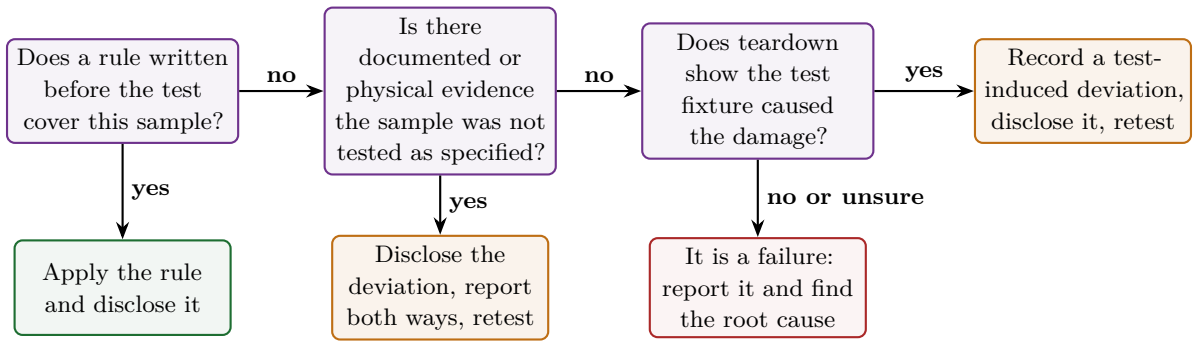


Figure 4.1: Three questions before excluding a test sample. Chamber B's failures follow the middle path (there is a logged deviation); C-04 reaches the third question, and unless teardown shows fixture damage, its nicked seal is a failure.

2026 context: audit trails

By 2026 many test rigs, chambers and data systems keep an automatic record of who changed what and when — Exhibit 3 is one. That changes the question an engineer faces. It is no longer whether an error or an edit could be found, but whether it will be *disclosed* before someone else finds it. The same applies to summaries drafted with AI tools: a summary that leaves out a failure or a deviation is still a false report, whoever or whatever wrote it.

Capstone move

In your next capstone progress report, add a short section headed "What did not work". List anything that failed, was redone or was left out, and why. See how your supervisor responds.

Discussion questions

1. Zelnick distinguishes business truth from social tact (the apple pie). Where is that line in an engineering team?
2. Zelnick could fire Kirk. Tomás cannot fire anyone. What can someone without authority do to protect a culture of honesty?
3. Edmondson (1996) found that better units reported more errors. How should a manager read a team's error count?
4. Walk C-04 through Figure 4.1. What evidence would change the answer?

Assignment — An honest report (Integrity File, Part 2)

Task. Choose a result from your capstone or co-op work that did not come out as hoped (a test, a simulation, a prototype, a schedule), or use Tomás's test if you have none.

1. Write a one-page report of it using every element of Table 4.1.
2. Apply Figure 4.1 to any data point you were tempted to leave out.
3. Write the first three sentences you would say to the manager who least wants to hear the result.

Deliverable and due date. Two pages (PDF), due at the end of week 2.

Marking (15 marks).

- *Report* (8): all six elements present and specific (8); one missing or vague (6); two (4); three or more (2); missing (0).
- *Exclusion analysis* (4): each questionable point taken through all three questions with evidence (4); reasoning incomplete for one point (3); for two or more (2); asserted without evidence (1); missing (0).
- *Opening sentences* (3): the result stated plainly first, with a next step (3); plain but no next step (2); softened or buried (1); missing (0).

Chapter 5

When You Make Mistakes

5.1 Three steps

Zelnick's argument

"It's a cliché, and a true one, that we all make mistakes. … A real mistake is a big one and I believe that a big mistake, generally speaking, is comprised of a long string of small mistakes that we failed to notice or correct along the way" (p. 61).

"The first step is to take personal responsibility for the problem, especially if it or its effects are ongoing, and to do so publicly if others are involved. … The second step, if possible — and I hope this is obvious — is to try to correct the error. The third and final step is to reflect on what you did wrong, why you did it, and what you can learn from it with an eye toward avoiding repetition. After you have completed all of that, leave it behind" (p. 61).

His example is his own. His firm pursued an acquisition he calls Blue Sky despite a possible conflict with an earlier obligation; when partners raised it, he replied, "Don't worry about it. I'll deal with it if and when the time comes" (p. 62). What could have been a small issue became a major one, resolved "only at great personal and financial expense" (p. 63). His response followed the three steps: "First, I took personal responsibility both within and outside of our firm. Second, we solved the problem even though it was costly and painful to do so. And third, we tried hard to learn a lesson from the mistake that we'd made, and then move on" (p. 63).

Zelnick's claim that big mistakes are strings of small ones matches a well-known model of error in safety-critical work. Reason (2000) contrasts a *person approach*, which blames individuals, with a *system approach*, which looks for the conditions that let errors through. In his "Swiss cheese" model, each defence has holes; an accident happens when the holes in several layers line up. Figure 5.1 applies it to Exhibit 3.

The figure does not excuse Tomás. The profile was his, and so was the error. It explains why punishing him alone would leave four holes in place for the next engineer.

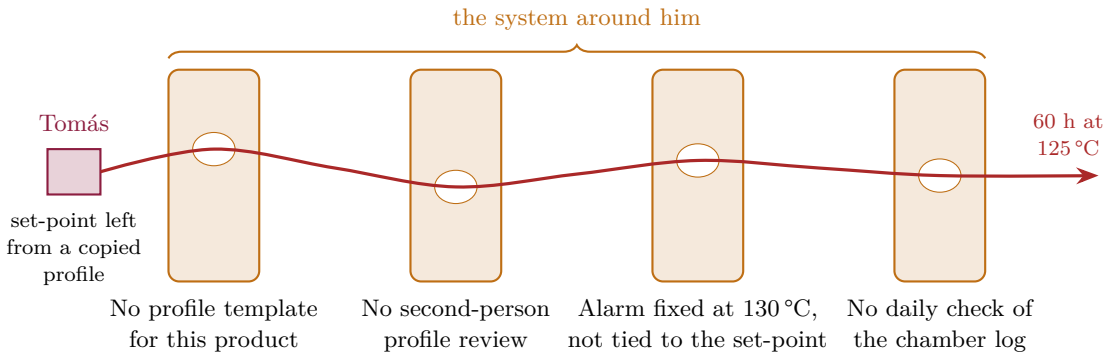


Figure 5.1: The chamber-B deviation drawn in the "Swiss cheese" model, after Reason (2000). An editing error became a test deviation that went unnoticed for six weeks only because several defences each had a hole in the same place. The error was Tomás's; the four defences that failed to catch it belong to the system.

5.2 Apologise, and never blame

Zelnick's argument

"In professional life a great executive and leader always apologizes when he or she is wrong. A sincere apology goes a long way toward resolving issues and restoring goodwill" (p. 64). "Being willing to apologize when you're wrong is an attribute of a responsible and decent human being. No one is infallible" (p. 65).

When a catalogue went out with costly, preventable errors at Lillian Vernon, a retailer his firm had taken over, rumours spread about who would be fired. At the next all-hands meeting Zelnick said: " 'I want you to know that I've searched long and hard and finally discovered who's responsible.' I paused. 'I am.' … 'I'm the chairman and it's my fault when things go wrong. Now, having gotten that out of the way, let's try to figure out how to fix this and learn from what happened, so we don't repeat it' " (p. 67).

What the research says: what apologies and blame do

- **Fuller apologies work better.** Lewicki et al. (2016) identify six possible components of an apology: an expression of regret, an explanation, an acknowledgment of responsibility, a declaration of repentance, an offer of repair and a request for forgiveness. Apologies with more of the components were judged more effective.
- **Blame is contagious.** People who watched someone blame others for a failure were more likely to blame others for their own, unrelated failures (Fast and Tiedens, 2010). Zelnick's "I am" interrupts that chain.

Myth check: "Admitting a mistake makes people trust you less"

Many engineers fear that owning an error will mark them as incompetent. In experiments on repairing trust, apologising worked better than denying when the violation concerned competence, and when later evidence showed the person was in fact at fault. Denial did better in two situations: for alleged violations of integrity, and when later evidence showed

the person was innocent (Kim et al., 2004). Neither result supports denial by someone who is at fault. Tomás's profile error is a competence error, and the log proves it. Denial is not an option that would survive; an apology is the better one anyway.

Engineering translation

An engineer's apology for a technical error has a practical shape. Say what happened and that it was yours ("I set chamber B to 125 °C for 60 hours"); say what it affected; say what you are doing to repair it; and say what you have changed so that it cannot happen the same way again. Leave out "but" and "if".

5.3 Learning without blame

Zelnick adds that "sometimes making mistakes is a necessary adjunct to trying new things: without the freedom to fail, many people won't take an appropriate risk" (p. 67). Engineering organisations have built that idea into practice.

What the research says: errors as a source of learning

In training, encouraging people to make errors and learn from them works better than trying to prevent errors. A meta-analysis of 24 studies found that error management training produced better performance than training that avoided or did not encourage errors (an average effect of $d = 0.44$), rising to $d = 0.80$ when people had to adapt what they had learned to new problems (Keith and Frese, 2008).

2026 context: blameless reviews

Many software organisations now write *blameless postmortems* after an incident. In the words of one widely used guide, "for a postmortem to be truly blameless, it must focus on identifying the contributing causes of the incident without indicting any individual or team for bad or inappropriate behavior" (Lunney and Lueder, 2016). Hardware and automotive teams use structured problem-solving reports, such as the 8D format, for the same purpose. Blameless does not mean unaccountable: the person who made the error still owns it, as Zelnick does. It means the review looks for every hole in Figure 5.1, not just the last one.

Capstone move

The next time something goes wrong on your capstone team, run a fifteen-minute blameless review: what happened, in order; what made it possible; and one change to make. Start by naming your own part, if you had one.

Discussion questions

1. Zelnick's third step ends "leave it behind" (p. 61). Why is that part of the advice, and when is it hard to follow?
2. "I am" worked for the chairman of Lillian Vernon. Would the same words work for Tomás? What would he need to add?
3. Name the four system holes in Figure 5.1 and who at Norval owns each.
4. When is a blameless review not appropriate?

Assignment — Blameless review of your own mistake (Integrity File, Part 3)

Task. Choose a mistake you made on a team project, co-op or job — large or small.

1. Write a factual timeline of what happened, in order, without judgement.
2. Draw its contributing causes as layers, as in Figure 5.1, marking which were yours and which were the system's.
3. Apply Zelnick's three steps: what responsibility you took (or should have), what you corrected, and what you learned.
4. Draft the apology you gave or should have given, using at least four of the six components in Lewicki et al. (2016).
5. Write a one-paragraph introduction to your *Integrity File* linking Parts 1–3.

Deliverable and due date. Three pages (PDF), due at the end of week 3.

Marking (15 marks).

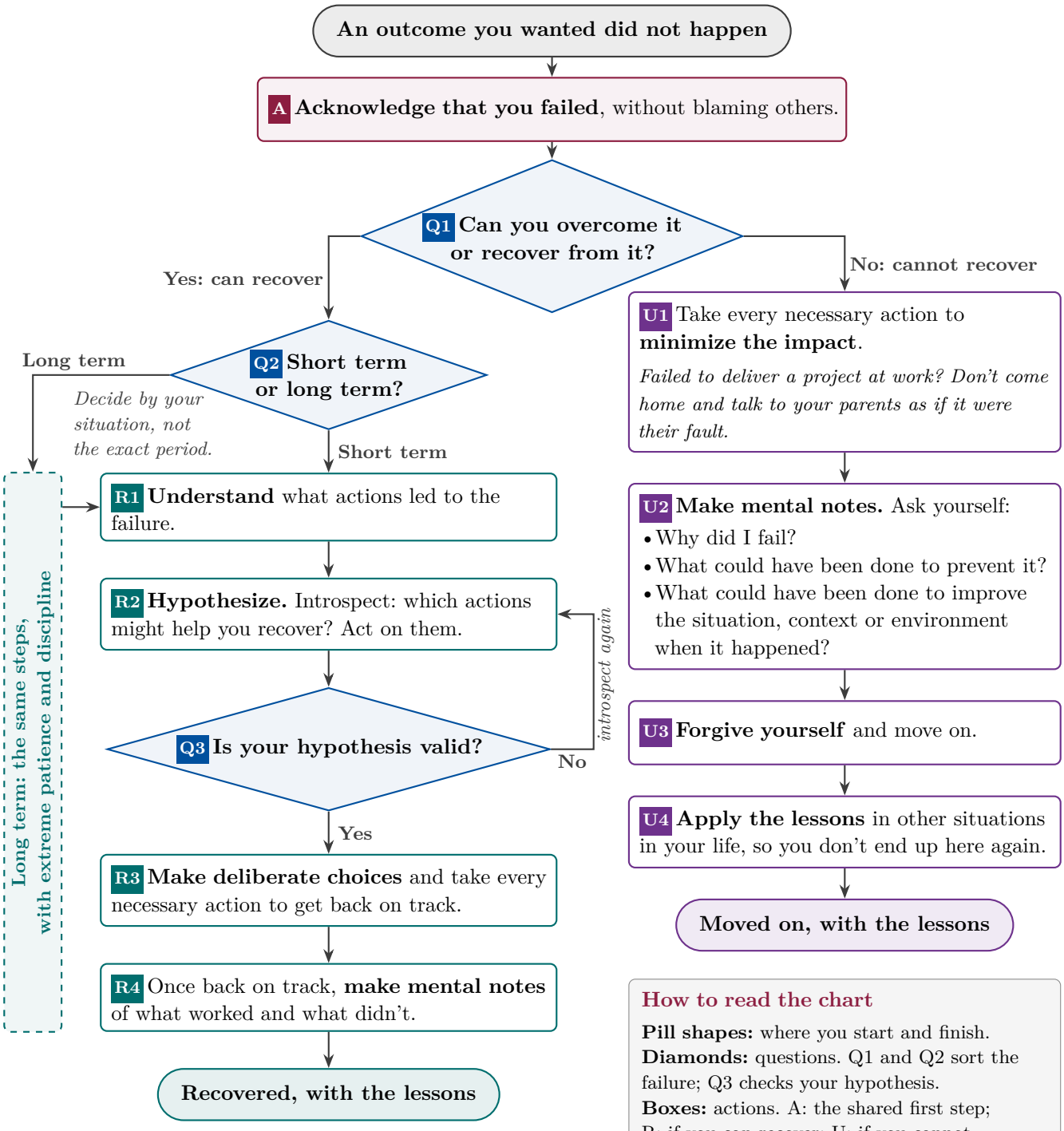
- *Timeline* (3): complete and neutral (3); complete but judgemental (2); partial (1); missing (0).
- *Contributing causes* (4): at least three layers, own and system causes both shown (4); own and system causes shown in fewer than three layers (3); only own or only system causes (2); a single cause (1); missing (0).
- *Three steps* (3): all three, specific (3); two (2); one (1); missing (0).
- *Apology* (4): four or more components, no qualifiers (4); three (3); two, or qualified (2); one (1); missing (0).
- *Introduction* (1): links Parts 1–3 (1); missing (0).

After a Failure: A Decision Chart

What kind of failure is this, and what do you do next?

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LinkedIn is full of success; few people talk about the failures that came first. Why is it so hard to acknowledge that we failed many times before getting what we wanted? After a good deal of success, for which I am grateful, I looked back at my career and at my personal, social, health and mental struggles. This chart sets out what I concluded, for anyone learning to overcome outcomes they did not want.



How to read the chart

Pill shapes: where you start and finish.
Diamonds: questions. Q1 and Q2 sort the failure; Q3 checks your hypothesis.
Boxes: actions. A: the shared first step; R: if you can recover; U: if you cannot.
Dashed band: the long-term route (R1–R4).

Recover or not, every path begins with honest acknowledgement and ends with lessons learned.

Adapted from a reflection on failure by Puranjan Gaur (2026). A companion to Lecture 6 (Integrity, Truth and Mistakes) and Lecture 9 (Renewal: Left Turns, Endings and a Whole Life). © 2026 Puranjan Gaur; licensed under CC BY-NC 4.0.

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Tomás what to do on Wednesday; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 is a clear result.** The requirement was 45 of 45; the result was 42 of 45. Whatever else is true, the test as run did not demonstrate the reliability the customer asked for.
- **Exhibit 2 asks for option 5 in Figure 3.1.** Replacing failed samples and reporting "45 of 45" misrepresents the result, and three spares could not even complete the test by Friday. "Fixture-related" is a euphemism, and "I don't need the details" is the phrase Zelnick warns about (Chapter 3).
- **Exhibit 3 cuts both ways.** It gives a documented reason why B-07 and B-11 may have failed early, which honest reporting can use. It also records Tomás's own error, which honest reporting must disclose (Chapter 4).
- **Exhibit 4 shows the temptation and the stakes.** "Gary's story covers my mistake" is the moment a small error meets a large lapse. The system holes in Figure 5.1 are as real as his error (Chapter 5).

6.2 One defensible opening

One defensible move is option (c): tell Dave and Gary together, early, with a plan. Here is one way he might open on Wednesday morning:

> **"Before we decide anything about Friday, you both need to know two things. The chamber-B profile I wrote ran those samples at 125 degrees for the first 60 hours — that was my error, and it may explain B-07 and B-11. C-04 ran at the right temperature and failed, so the test did not pass, and I can't put my name to a report that says 45 of 45. Here is what I think we can submit instead."**

It owns the mistake first, states the result without euphemism, draws the line, and moves straight to a solution.

6.3 A worked plan

Table 6.1 sets out one plan for the rest of the week and after.

Table 6.1: One plan for Tomás's week and the weeks after.

When	Action	Chapter
Tuesday night	Write down what is known and unknown. Change nothing in the data or the logs	4
Wed 8:00	Tell Dave and Gary together, using the opening in Section 6.2	3, 5
Wed–Thu	Propose submitting the true result with a deviation report for chamber B; find the root cause of C-04's nicked seal (assembly, handling or fixture); ask Arden for interim approval and a six-week retest, well before August. Write the report using Table 4.1	4
If Gary insists	Decline to sign a false report; take the question to the quality or engineering director, in writing. If a false report still goes out, the Code of Ethics puts public welfare first: seek advice from a senior licensed engineer before contacting Arden (option (d))	3
Next week	Lead a blameless review of Figure 5.1: a profile template, a second-person review, alarm limits near the set-point, and a daily log check	5

> **The one-sentence version of this lecture.** Decide where your line is before the pressure arrives, default to the truth in everything you report, and when you make a mistake, own it first, fix it second and learn from it — without blaming anyone else.

Glossary

Apology components Regret, explanation, acknowledgment of responsibility, repentance, offer of repair and request for forgiveness (Lewicki et al., 2016).

Blameless postmortem A review of an incident that identifies contributing causes without indicting individuals (Lunney and Lueder, 2016).

Deviation A departure from the specified test procedure, which must be recorded with its cause and effect.

Error management training Training that encourages errors and learning from them rather than avoiding them (Keith and Frese, 2008).

Ethical fading The process by which the ethical side of a decision drops out of view through self-deception (Tenbrunsel and Messick, 2004).

Interim approval A customer's time-limited approval of a production part while open issues are resolved.

Moral disengagement Cognitive mechanisms, such as euphemism or displacing responsibility, that let people act against their own standards without feeling it (Moore et al., 2012).

PPAP Production part approval process: the package of evidence a supplier submits to show that a part meets the customer's requirements before production.

Slippery slope The escalation from small unethical acts to larger ones (Welsh et al., 2015).

Success-run test A test in which no failures are allowed; with n passes it demonstrates reliability R at confidence C, where $1 - C = R^n$.

Swiss cheese model A model in which accidents happen when holes in several layers of defence line up (Reason, 2000).

Teardown Disassembly of a failed part to find the physical cause of failure.

Voice and silence Speaking up, or choosing not to, about problems or concerns at work (Morrison, 2014).

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 5. Its job is to show engineering students that integrity is tested in ordinary technical moments — a test result, a deadline, a small error — and that there are practical habits that protect it. Materials: printed copies of Exhibits 1–3, and a board for Figure 3.1.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Read Exhibit 2 aloud. Ask the class to rewrite it without euphemism. Vote on Exhibit 4's options.
10–30	Integrity	Work through Table 3.1; students add phrases they have heard. Draw Figure 3.1 and place the class's suggestions on it.
30–50	Truth	Walk C-04 and B-07 through Figure 4.1. In pairs, draft the "Deviations" paragraph of Table 4.1. Cover the lying myth check.
50–65	Mistakes	Build Figure 5.1 on the board. Role-play Wednesday 8:00: one student as Tomás, one as Gary.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); hand out the Integrity File (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: to discard three failures and report a pass the test did not achieve. Q2: it explains them but does not remove them; the test was still not run as specified. Q3: it ran at the specified condition and its seal defect could occur in production. Q4: (c); start with his own error. Q5: the profile error; no template, no review, an alarm not tied to the set-point, no daily log check.

Chapter 3

Q1: answers vary; "just this once" is often heard. Q2: it removes the speaker's knowledge and leaves the listener alone with the decision. Q3: option 4, or 5 if the reruns are reported as the original samples — it selects data to fit the answer. Q4: refusing may cost Gary's favour; agreeing risks his future licence, his reputation and possibly a recall.

Chapter 4

Q1: tact is about how, not whether; facts about the work are always disclosed. Q2: report accurately, record concerns in writing, use escalation channels, and model the behaviour. Q3: a low count may mean silence, not safety. Q4: teardown evidence that the test fixture caused the nick would send it down the "yes" branch of question 3.

Chapter 5

Q1: to stop a mistake turning into lasting self-blame; hard when others were harmed. Q2: he needs to name the specific error and the repair, not just the responsibility. Q3: template (engineering procedures), profile review and daily log check (validation lead), alarm limit (lab). Q4: when the behaviour was deliberate or reckless.

Marking guidance

A strong Part 1 writes rules specific enough to apply on a bad day. A strong Part 2 states the result in the first sentence and discloses every deviation. A strong Part 3 shows both personal and system causes and an apology with no "but". The three parts total 40 marks.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. His account of how the Enron collapse began (pp. 53–54) is offered, in his words, as what he "suspect[s]"; it is an illustration of drift, and the lecture's evidence on small steps (Welsh et al., 2015) supports the mechanism.

2. "If you lie, we'll fire you" (p. 113) is an owner's rule. An engineer applies the same standard through reporting channels, and teams hold it best when honest error reports are protected (Edmondson, 1996).

3. "A great executive and leader always apologizes" (p. 64) is sound advice; students should also know their employer's policy on apologies where legal questions arise.

None undermines his argument, and spotting them models the habit of checking sources.

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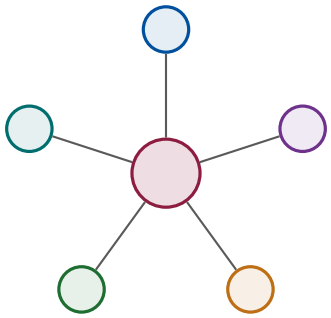
Success as an Engineer — Professional Practice Series

Lecture 7

From Engineer to Leader

Letting go of the work that made you good

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The New Lead (embedded / firmware engineering)
Year:	2026



from doing the work to making it possible

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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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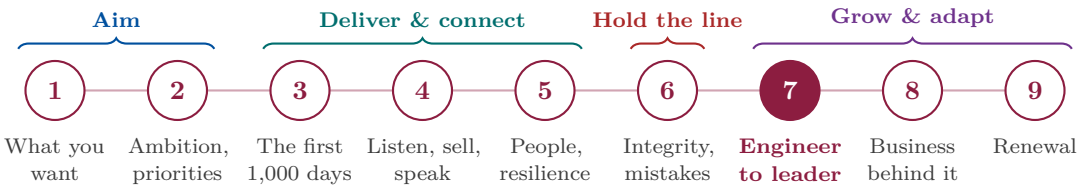
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Chapter 1

About This Lecture



Most engineers who become leaders are promoted because they were good engineers. The first surprise is that the job has changed: the skills that earned the promotion are not the skills it now requires. This lecture is about that change — letting go of doing the work yourself, leading people who were your peers, giving feedback that can be heard, setting incentives that reward the right things, and making decisions on time.

Learning objectives

By the end of this lecture you will be able to:

- **Explain** why the skills that earn a promotion differ from those the new role needs, and what the evidence says about promoting the best individual performer.
- **Plan** what to delegate, what to keep and what to stop as a new technical lead.
- **Combine** steady respect with clear boundaries, and keep the commitments you make.
- **Give** feedback about the work rather than the person, in a way that can be heard.
- **Judge** whether an incentive will reward the behaviour you want, and name how it could be gamed.
- **Decide** when to stop analysing and make the call, and when to wait a day.
- **Build** your *Leadership Plan*: three short parts, built across the chapter assignments, for a leadership role on your capstone, club or co-op.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: "Managing People Is Like Raising Children", "Do What You Say You're Going to Do", "Managing Talent", "Align Incentives and Avoid Discretionary Compensation", "Two Useful Rules About Decision Making", "Focus on the Big Trick" and "Getting Ahead Means Leaving Some Things Behind".

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: why engineers move into management, the dual career ladder, the difference between an engineer's role and an engineer-manager's, and delegation.

Research, mostly peer-reviewed, tests both. It covers promotion, feedback, leader–member relationships, empowering leadership, incentives and decision making.

1.2 The boxes in this lecture

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary, at the end of the lecture.

Reading plan (about 85 minutes) and the Leadership Plan

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Lena's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Leadership Plan**, for a role in which you lead others — a capstone sub-team, a design-team subsystem, a club or a co-op project: Part 1 (a time audit and delegation plan, due at the start of week 2), Part 2 (a team charter and a feedback conversation, due at the end of week 2) and Part 3 (an incentive review and a decision log, due at the end of week 3).

Chapter 2

Case Study: The New Lead

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Thursday 7 October 2027, 7:30 p.m.

Lena Fischer was still at her desk at Tallis Metering in Waterloo, Ontario, rewriting a flash driver that one of her engineers had been assigned three weeks earlier. On her second monitor was a calendar invitation from her director for Tuesday morning, after the Thanksgiving holiday: "Firmware 4.2 — go / no-go." Four months into her first leadership job, she had the feeling that she was working harder than ever and leading nobody.

2.2 The promotion

Tallis makes smart electricity meters for Ontario utilities. Their firmware is updated over the air (OTA). Lena, an engineer-in-training (EIT) working toward her P.Eng. licence, with four years at the company, was the best firmware engineer on the team: she had written the bootloader and most of the radio stack. On 1 June the director of engineering, Rob Tessier, made her lead of the six-person firmware team. One of the five engineers she now led, Marc Bélanger, had eleven years at Tallis and had applied for the same job. Another, Jordan Okoye, had been her closest friend at work since they joined together.

2.3 Four months in

In the last week of September Lena kept track of where her time went (Exhibit 1).

Exhibit 1 — Lena's week, 27 September to 1 October 2027 (hours)

Activity	Hours	Note
Writing code herself	21	flash driver (taken back Tue); radio bug
Reviewing others' code	9	she reviews every merge request
Meetings (planning, cross-team, customer)	11	
Email and chat	6	
One-on-ones with her five engineers	1	5 slots planned; she cancelled 3
Hiring and planning for 2028	2	
Total	50	

Exhibit 2 collects three things that had happened since June.

Exhibit 2 — Lena's notes on the team, June to October 2027

- **Marc**, the day after the announcement: "Congratulations. I'll stick to the code, then." He has stopped speaking in design reviews. In July Lena told him she would "look into" moving him to the new cellular-module project. She has not.
- **Jordan**, after a sprint review in which Lena had called his retry logic "the kind of thing I'd expect from a co-op student": "Seriously? In front of everyone?" They have not had lunch since.
- **The flash driver**: assigned to Aiko Tanaka, eighteen months out of school, on 15 September. Lena took it back on 28 September "to save time". Aiko has not asked for another task.

2.4 The bonus plan

At her first leads' meeting, Rob proposed a quarterly bonus plan. A sister team had piloted it in the spring (Exhibit 3).

Exhibit 3 — Proposed bonus plan and the spring pilot on the test-tools team

Proposal: a quarterly bonus of $75 for every ticket an engineer closes, up to $3,000 a quarter, plus a discretionary pool of $10,000 per team for the lead to allocate.

Test-tools team, per quarter	Before pilot	During pilot
Tickets closed	140	212
Tickets reopened within 30 days	9	31
Defects found by customers	4	7
Tickets opened by the team itself	38	96

2.5 The decision

The Tuesday meeting was about Firmware 4.2, which added support for a new time-of-use tariff that Tallis's largest customer, a regional utility, needed on its 180,000 meters by 1 November. Lena had found a fault in how the bootloader swaps in a new firmware image (Exhibit 4).

Exhibit 4 — Lena's status note on Firmware 4.2, Wednesday 6 October 2027

- If power is lost while the bootloader is swapping in the new image, the meter can be left with no working image. In lab tests we cut the power at a random moment during each of 12,000 simulated updates. Three left the meter unable to boot: about 1 in 4,000 interrupted updates. An update takes about four minutes. A bricked meter needs a technician visit, at about $180.
- Ten days ago I asked for three more weeks to model every power-loss window before we decide. The team is still modelling.
- Aiko suggested a two-stage update that keeps the old image until the new one is verified, so a power loss during the swap falls back to the old image. It would take about eight days to build and test. I haven't looked at it properly yet.
- Option: staged rollout (1%, then 10%, then the rest) with the update paused if any meter fails to report back.

Lena closed the flash driver and opened a blank document titled "Tuesday".

Discussion questions

Before reading further, write a short answer to each question.

1. What does Exhibit 1 say about the job Lena is doing, as opposed to the job she was given?
2. What did each event in Exhibit 2 teach the person on the other end of it?
3. Predict what the bonus plan in Exhibit 3 would do to Lena's team. Which numbers support your prediction?
4. Is Lena ready to decide on Tuesday? What would she need, and from whom?
5. Write the first sentence Lena should say to Marc, and the first to Jordan.

We return to Lena in Chapter 6.

Chapter 3

From Doing to Leading

3.1 Getting ahead means leaving some things behind

Zelnick's argument

"When we achieve success at something, it is human nature to repeat what we did, figuring it will likely yield the same result. … Yet the fact is that the attributes that work well in one situation are often not those that lead to success in a subsequent situation" (p. 135).

His example is Gerry Levin, who rose from business analyst to chief executive of Time Warner. "The problem was that being a successful analyst and strategist required a different skill set than that of being a successful CEO. The primary role of a CEO is to understand the big picture …, to lead the team, to keep an organization focused on its goals and regularly to make the most difficult decisions. Gerry was too busy continuing to be a great analyst to spend the appropriate time or to give enough attention to the other requirements of being a CEO" (pp. 135–136). "Not only must we change our approach as we move up the ladder, we also often have to learn new skills that we didn't previously have" (p. 136).

Lena's week (Exhibit 1) is Levin's problem at a smaller scale. Twenty-one of her fifty hours went into writing code, the work that made her the obvious choice for the job. One hour went to her engineers individually. Morse, Schell & Babcock set out the difference in roles.

What Morse, Schell & Babcock add: the engineer's role and the engineer-manager's

Morse, Schell & Babcock reproduce a comparison from Amos and Sarchet: the engineer "originates projects", "works on specific programs" and "utilizes own skills"; the engineer-manager "evaluates projects", "does overall planning" and "utilizes skills of others to obtain goals" (Morse et al., 2020, p. 385). They warn that "the skills that bring an engineer to prominence and result in promotion into a first management position are not necessarily the skills needed in the new management position. The engineer is a doer; an effective manager is a facilitator of other people's work" (Morse et al., 2020, p. 384). And on delegation: new engineering managers "often find it difficult to trust others for matters they used to handle personally. Nonetheless, they will progress no further until they learn not only to assign jobs, but to delegate authority and still exact accountability for results" (Morse et al., 2020, p. 387).

Myth check: "Promote your best engineer and you get your best manager"

Organisations often promote their strongest individual performers, on the assumption that skill in the work predicts skill in leading it. A study of salespeople in 131 firms found that

firms promoted on current sales performance rather than on traits that better predicted success as a manager, and that this cost them: top sellers promoted to manager tended to be worse managers, judged by their teams' sales (Benson et al., 2019). This is the pattern popularly called the *Peter principle*. It does not mean strong engineers make poor leaders. It means the promotion decision should look at the new job's skills, and that the person promoted must deliberately learn them.

What the research says: what new managers get wrong, and what helps

- **Authority is not control.** In a summary of her research on first-time managers, Linda Hill describes common misconceptions: that a new title brings the power to make things happen, and that the job is to control subordinates. In practice, new managers find they depend on many people they do not control (Hill, 2007).
- **Sharing authority pays.** A meta-analysis of 105 samples found that *empowering leadership* — delegating authority, encouraging people to act on their own and developing their capability — was positively related to employees' performance, citizenship behaviour and creativity (Lee et al., 2018).

Taking the flash driver back from Aiko (Exhibit 2) saved Lena a few days. It also told Aiko that her work would be taken away when it was hard, and it left Lena doing an engineer's job instead of a lead's.

3.2 What to keep, what to give away

Delegating is not dumping. A new lead has to decide, task by task, whether to keep it, delegate it fully, delegate it with support, or stop doing it. Figure 3.1 sorts Lena's work and commitments that way.

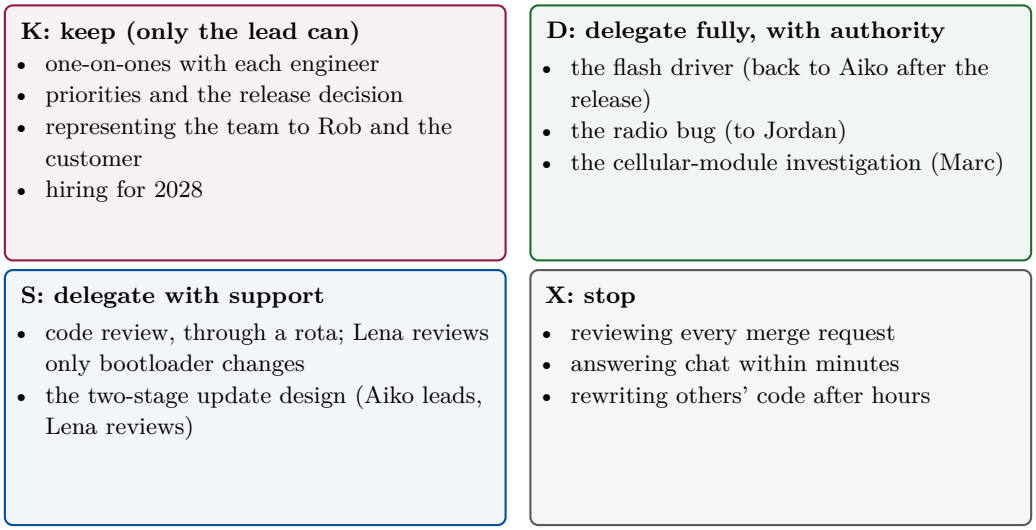


Figure 3.1: Lena's work and open commitments from Exhibits 1, 2 and 4, sorted into what to keep, what to delegate and what to stop. The top-left box holds the work her engineers cannot do for her.

Engineering translation

For an engineer, delegation has a testable definition: the person doing the task can make the decisions inside it without asking you, and is accountable for the result. "Aiko owns the flash driver; she decides the design; I review the final merge request" is delegation. "Aiko is helping me with the flash driver" is not. The Morse, Schell & Babcock phrase is exact: delegate authority, and still exact accountability.

What Morse, Schell & Babcock add: two ladders

Morse, Schell & Babcock note that about 80% of engineers and scientists in Badawy's career-goal interviews said they wanted to become a supervisor or manager within five years, often for reasons that, they warn, "can be the wrong reasons", such as pay, status or fear of obsolescence. Many organisations also offer a *dual career ladder*, a technical track with levels parallel to management (Morse et al., 2020, pp. 382–383). "If, instead, you find more satisfaction in what you accomplish and create personally, you may want to remain primarily a technologist" (Morse et al., 2020, p. 383).

2026 context: AI assistants and distributed teams

By 2026 AI coding assistants are increasingly common in software and firmware work, and many teams work partly remotely. Both make a new lead's choices sharper. An assistant can make it even more tempting to write the code yourself, because it is fast; the work that only a lead can do — one-on-ones, priorities, decisions — is not the kind an assistant does. And on a distributed team, a skipped one-on-one may be the only private conversation an engineer has with the lead that week.

Capstone move

Write down every task you do for your capstone team this week. Mark each one K (keep), D (delegate), S (delegate with support) or X (stop). Hand off one D task, with the authority to decide, before Friday.

Discussion questions

1. Zelnick blames Levin for staying an analyst. Is it fair to blame the person, or should the organisation have prepared him?
2. Why does taking work back "to save time" usually cost time?
3. What would make a technical ladder at Tallis a real alternative for Marc?
4. Would you want to lead a team in your first five years? Which of Badawy's reasons, as Morse, Schell & Babcock report them, apply to you?

Assignment — Time audit and delegation (Leadership Plan, Part 1)

Task. Choose a role in which you lead or coordinate others (a capstone sub-team, a design-team subsystem, a club executive role or a co-op project).

1. Record your time for the five working days of week 1 in a table like Exhibit 1.
2. Sort the tasks into a grid like Figure 3.1.
3. Delegate one task fully. Record who, what authority you gave, and how you will know it is done.
4. Write one paragraph on what you found hardest to let go of, and why.

Deliverable and due date. Two pages (PDF), due at the start of week 2.

Marking (10 marks).

- *Time audit* (3): a full week, categorised (3); a full week uncategorised, or three or four days (2); estimated rather than recorded (1); missing (0).
- *Grid* (3): every task placed, with a reason for each (3); placed without reasons (2); most tasks missing (1); missing (0).
- *Delegation* (3): one mark each for the person, the authority given and the check.
- *Reflection* (1): specific (1); missing or generic (0).

Chapter 4

Respect, Boundaries and Feedback

4.1 Steady respect and clear boundaries

Zelnick's argument

Zelnick and his wife settled on two things they would try to get right as parents: "unconditional love and boundaries" (p. 96). He applies the same idea to managing people. "Your colleagues and employees need to know that you respect and admire them, and that this respect and admiration doesn't come and go depending on day-to-day performance (unconditional love). They also need to know that there are certain things you will and will not do and certain things they must and cannot do (boundaries)" (p. 97).

Boundaries did not come easily to him. "I didn't like confrontation, especially with people who had tough personalities, and I didn't like saying no" (p. 98). He now says: " 'Look, we may just disagree. In this instance I have to make a tough decision. I know it's not what you want, but here it is.' Establishing clear lines ultimately shows others respect, because it's truthful and open. It also saves time and ensures your team is moving in the right direction" (p. 98).

Lena has the two halves the wrong way round. Her respect for Jordan came and went with one piece of retry logic; her boundaries — what she will review, what she will decide, what each engineer owns — were never stated, so she enforced them by taking work back.

What the research says: the relationship is the job

Research on *leader–member exchange* studies the quality of the working relationship between a leader and each team member. A meta-analysis found that higher-quality relationships were associated with better job performance, higher satisfaction and commitment, clearer roles and lower intentions to leave (Gerstner and Day, 1997). Leaders and members agreed only moderately about how good their relationship was — a reason for Lena to ask, in one-on-ones, rather than assume.

4.2 Do what you say you're going to do

Zelnick's argument

"If you say to your team or colleagues, 'I'm going to do X' and you don't do it, you immediately lose credibility and therefore effectiveness. Not doing what you say you're *not* going to do is equally important" (p. 99). Bidding for a company, Zelnick told his banker that $13 a share was "our last and final offer"; when the banker said $13.25 might win it, he walked away, so that "everyone now knows that if I say 'This really is our limit,' I mean

it. … Credibility and consistency in all your dealings is vastly more valuable than any one deal" (pp. 99–100).

Lena told Marc in July she would "look into" the cellular-module project (Exhibit 2). Three months later nothing has happened. To Marc, that is not a delay; it is an answer. A lead's small promises — to review something by Friday, to raise a concern with the director, to look into a transfer — are how the team learns whether the lead's word means anything.

4.3 Feedback that can be heard

Zelnick's argument

At Fox, Zelnick gave the screenwriter Dale Launer "a lengthy critique". Launer's advice in reply became one of Zelnick's rules: start with things other than the project, then "start by discussing the many things you like about it", and only after "every possible sincere compliment" mention "a handful or less of things that you think could be improved" (pp. 103–104). "If criticism is to be useful it has to be conveyed in an atmosphere of mutual respect and goodwill" (p. 104). "Blunt feedback isn't just inelegant and perhaps unkind — it's also unlikely to be heard and therefore put to use" (pp. 104–105).

He also avoids "but". "If you say in a business setting, 'I think you're doing a fine job, but I really wish you would do X' you have instead conveyed: 'We're not talking about the good job you've done. We're talking about what you haven't done right' ". In its public communications, his firm substitutes "that said" for "but" (p. 105).

Zelnick draws his lesson from creative people, whose work is "both personal and subjective", and applies it to "general management, in which many decisions are at least partially subjective" (p. 104). Engineering review is less subjective: retry logic either handles a dropped packet or it does not. But the person receiving the review is just as human, and Lena's comment to Jordan was about him, not the code.

Myth check: "Feedback always improves performance"

It is easy to assume that more feedback is always better. A landmark meta-analysis of feedback interventions, covering 607 effect sizes and 23,663 observations, found an average improvement of $d = 0.41$ — but more than a third of the interventions *reduced* performance. Feedback became less effective as it drew attention away from the task and toward the person (Kluger and DeNisi, 1996). Lena's comment to Jordan was feedback about the person.

Table 4.1 shows Lena's comment to Jordan and three rewrites of it.

Table 4.1: Rewriting Lena's sprint-review comment (Exhibit 2) so that it is about the task, private where it needs to be, and specific enough to act on.

Version	What Lena says
As said, in public	"That's the kind of thing I'd expect from a co-op student."
About the task	"The retry loop has no back-off. On a dropped link it will retry every 50 ms and flood the radio."
Specific and actionable	"Can we add exponential back-off with a cap, and a test that drops the link for ten seconds?"
With respect, in private	"Your state machine for the retry path is clean and easy to follow. That said, the loop needs back-off before we ship. Can you add it, with a test? Happy to pair on it."

Engineering translation

Engineering teams can build Zelnick's advice into their tools. Code-review guidelines that say "comment on the code, not the author", ask for a reason with every blocking comment, and move disagreements longer than two rounds to a call all do the same thing: they keep feedback on the task. For praise, the rule runs the other way. Specific praise in public, for a particular piece of work, tells the whole team what good looks like.

Capstone move

In your next code or design review, write every comment so that it names the artefact, the problem and a suggested fix. Then find one thing in the same work to praise specifically, and say it first.

Discussion questions

1. Zelnick compares managing people to raising children. Where does the comparison help, and where would it offend the people being managed?
2. Lena and Jordan are friends. Does that make feedback easier or harder? Should she treat him differently from the others?
3. Zelnick's feedback advice came from creative work. Which parts transfer to a code review, and which do not?
4. Zelnick found saying no hard. Which boundary would you find hardest to set as a lead, and how would you say it?

Assignment — Charter and feedback (Leadership Plan, Part 2)

Task. For the team you chose in Part 1:

1. Write a one-page team charter: what each member owns and decides, what you as lead will and will not do, and how disagreements are settled.
2. List every commitment you have made to a team member in the last month, and whether you kept it. Close or renegotiate any that are open.
3. Plan, hold and write up one feedback conversation about a piece of work, rewriting your opening as in Table 4.1.

Deliverable and due date. Three pages (PDF), due at the end of week 2.

Marking (15 marks).

- *Charter* (5): ownership, decision rights, lead's commitments and a disagreement rule, all specific (5); one missing or vague (4); two (3); three (2); a list of values only (1); missing (0).
- *Commitments* (4): complete list, each closed or renegotiated (4); complete, some left open (3); partial (2); asserted without a list (1); missing (0).
- *Feedback* (6): about the task, specific, actionable, with sincere praise and a reflection on how it was received (6); one element weak, meaning present but vague (5); two (4); three (3); four or more (2); about the person, whatever the other elements (1); missing (0).

Chapter 5

Incentives and Decisions

5.1 People follow the incentives

Zelnick's argument

"It's extraordinary to us how many enterprises lose sight of the fact that most human beings, whether they are consciously aware of it or not, follow the money. Financial incentives, especially in for-profit settings, order and organize a great deal of employee behavior" (p. 107). His firm tries to create systems in which "(a) a great deal of compensation is conditioned upon corporate performance; (b) the calculation of bonuses is straightforward and easy to understand; and (c) most if not all compensation is formulaic as opposed to discretionary" (p. 107).

Discretionary pay, he argues, "permits, if not encourages, internal politics. At Fox, where annual bonuses were entirely discretionary and paid in early August, no one took a vacation in July and in the weeks leading up to bonus payments there was an inordinate amount of human traffic outside of the CEO's office — as senior executives jockeyed for face time" (p. 109). His line to new teams: "Your earnings will not be enhanced by smiling at me in the hallways" (p. 110).

He makes one exception. At Time Life, junior managers' bonuses could be adjusted up or down by their individual performance reviews, "the theory being that such employees had limited influence on overall company results" (p. 108).

Zelnick's own example ties bonuses to operating profit, a measure of the whole company's results. Rob's proposal (Exhibit 3) does something different: it pays each engineer for closing tickets. That measure can be moved without moving the result the company wants — working, reliable firmware — and the pilot shows it moving.

What the research says: what incentives do, and what they miss

- **Incentives raise quantity, not quality.** A meta-analysis of 39 studies found that financial incentives were related to the quantity of performance (corrected $r = .34$) but not to its quality (Jenkins et al., 1998).
- **Intrinsic motivation still matters.** A 40-year meta-analysis ($k = 183$) found that intrinsic motivation predicted performance and was the stronger predictor of its quality, while incentives were the stronger predictor of quantity. Where incentives were tied directly to performance, intrinsic motivation mattered less, a "crowding out" effect (Cerasoli et al., 2014).
- **Design decides.** A review of incentive programmes outside the workplace concludes that incentives can work, but that poorly designed ones can backfire, for example by

weakening people's own reasons for doing the task (Gneezy et al., 2011).

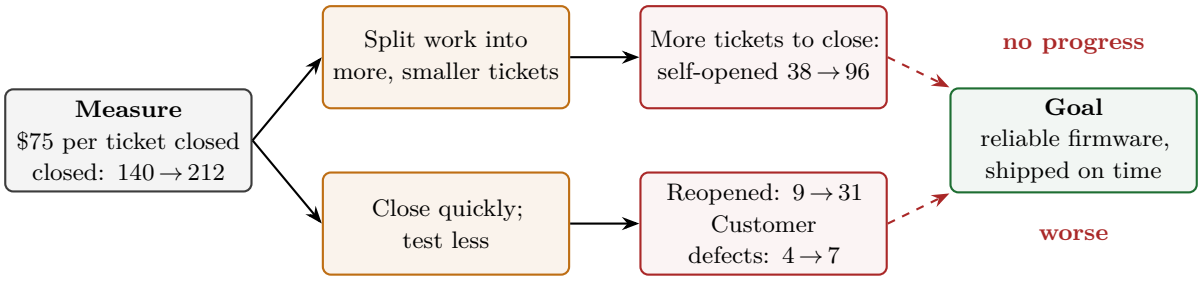


Figure 5.1: How the ticket bonus in Exhibit 3 rewards behaviour that does not move the team toward its goal, or moves it away (dashed arrows). The behaviours in the second column are likely explanations; the numbers are from the spring pilot.

The pilot in Exhibit 3, drawn in Figure 5.1, reads like a textbook case. Tickets closed rose by half, but tickets reopened more than tripled, customer-found defects nearly doubled, and the team opened two and a half times as many tickets for itself.

Engineering translation

Before accepting any metric as a target, an engineer can ask three questions. Can it be increased without improving the product? Can the people measured change it by changing how they report? Does it reward individuals for work that depends on the team? A ticket count fails all three. A team-level measure of escaped defects and on-time delivery, reviewed alongside the lead's judgement, is much harder to game — and, in Zelnick's spirit, the lead's discretionary share should be small, announced and explained.

5.2 Two rules about deciding

Zelnick's argument

The 80/20 rule. "With 20 percent of the work you can obtain 80 percent of the information required to make a sound decision. Incremental work will yield steeply diminishing value at steeply increasing cost" (p. 117). He describes a senior executive he calls Irv, whose team worked around the clock on models that he tore apart and sent back: "Often opportunities would evaporate, or decisions would become stale or moot, during the days or even weeks that Irv's group did endless research and iterative modeling" (p. 118). "At a certain point, though, one has to know when additional work will neither influence nor improve the conclusion, and that's the time to stop the process and make a decision" (p. 118).

The 24-hour rule. When there is no clear path, his partner's rule applies: "take a day before you make a decision". "Sometimes waiting a day for the smoke to clear can help a lot. … At a certain point, though, it's the job of a leader to decide, and so we make the call. After that, we don't second-guess" (p. 119).

A third rule, from a section a few pages later, is about where to spend attention. Zelnick credits it to the businessman Larry Tisch, who called it "the big trick", and paraphrases his advice: "Don't spend too much time on little things. The important choices and opportunities are the ones that move the dial" (p. 122).

What the research says: fast decisions can be good decisions

In a study of top management teams in eight microcomputer firms, the teams that made strategic decisions fastest did not use less information. They tracked more real-time information, considered several alternatives at once and drew on experienced advisers — and faster decisions went with better performance (Eisenhardt, 1989). Speed came from how the teams worked, not from skipping the analysis.

Myth check: "Step away and your unconscious will solve it"

The 24-hour rule is sometimes justified by the claim that the unconscious mind solves complex problems better than deliberate thought. A meta-analysis and a large replication (399 participants) found no reliable support for that "unconscious thought advantage" (Nieuwenstein et al., 2015). Those studies tested a few minutes of distraction, not a night's sleep, which is a separate question. Zelnick's own reasons are better ones: a day lets facts arrive, lets options surface, and lets people "refresh" themselves (p. 119). The rule works when the day is used to gather the missing information, not when it is used to wait for inspiration.

Lena's release decision needs both rules. Three more weeks of modelling (Exhibit 4) is Irv's approach: more analysis of a risk she already understands well enough to act on. What she does not yet have is a proper look at Aiko's two-stage update and a plan for a staged rollout. Figure 5.2 lays out the decision.

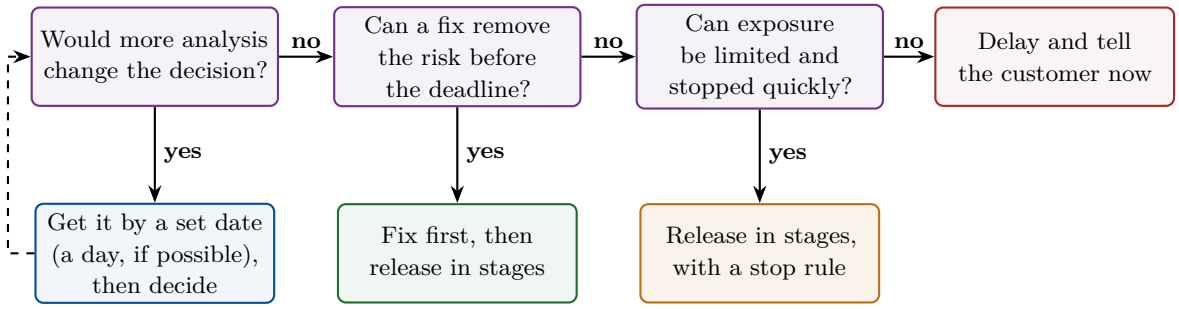


Figure 5.2: A decision path for Firmware 4.2 built on Zelnick's 80/20 and 24-hour rules: first ask whether more analysis would change the answer, then look for a fix, then for a way to limit the exposure. The dashed arrow returns to the first question once the information is in.

2026 context: decisions over the air

By 2026, over-the-air updates are routine for connected devices, from meters to cars. That changes the shape of many release decisions: a staged rollout, with telemetry and an automatic stop, turns a single all-or-nothing choice into a series of small, reversible ones. It also raises the stakes of a fault that cannot be reversed remotely, such as a device that no longer boots. Leads increasingly decide not just *whether* to ship, but *how fast* and with what stop rule.

Capstone move

Find the oldest open decision on your capstone team. Write down what information would change it. If none would, make the decision this week, record it with the reasons, and stop revisiting it.

Discussion questions

1. Zelnick prefers formula bonuses to discretionary ones. What does a formula lose, and when is discretion better?
2. Which of your university's grading rules reward the measure rather than the learning?
3. When is the 80/20 rule dangerous in engineering? Give an example where the last 20% of analysis matters.
4. Walk Firmware 4.2 through Figure 5.2. Where does it come out, and what would change that?

Assignment — Incentives and decisions (Leadership Plan, Part 3)

Task. For the team you chose in Part 1:

1. Identify one measure your team is judged by (a grade component, a sprint metric, a club target). Draw a chain like Figure 5.1 showing how it could be gamed, and propose a better measure.
2. Keep a decision log from the first day of week 2 to the end of week 3: each decision, the date it arose, the date it was made, the information that changed it (if any) and who made it.
3. Pick the slowest decision and apply Figure 5.2 to it.
4. Write a one-paragraph introduction to your *Leadership Plan* linking Parts 1–3.

Deliverable and due date. Three pages (PDF), due at the end of week 3.

Marking (15 marks).

- *Incentive review* (5): gaming chain and a better measure that passes the three questions (5); chain and a weak alternative (4); chain only (3); gaming without a chain (2); no analysis (1); missing (0).
- *Decision log* (5): at least five decisions, all fields complete (5); five or more, some fields missing (4); three or four (3); one or two (2); reconstructed afterwards (1); missing (0).
- *Slowest decision* (4): Figure 5.2 followed to an outcome, with evidence at each question reached (4); outcome reached, evidence missing at one question (3); outcome without evidence (2); questions only, no outcome (1); missing (0).
- *Introduction* (1): links Parts 1–3 (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Lena what to do on Tuesday; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 shows an engineer, not a lead.** Twenty-one hours of her own code and one hour with her engineers is Levin's pattern (Chapter 3). Reviewing every merge request makes her the team's bottleneck.
- **Exhibit 2 shows three lessons the team has learned.** Marc learned that her promises lapse; Jordan, that her respect depends on the last piece of work; Aiko, that hard work is taken away (Chapters 3 and 4).
- **Exhibit 3 shows a measure that can be moved without moving the goal.** The pilot's rise in reopened tickets and self-opened tickets is the gaming the design invites, and the $10,000 discretionary pool invites the hallway politics Zelnick describes (Chapter 5).
- **Exhibit 4 shows a decision stuck in analysis.** Three points settle it without more modelling:
  - The lab rate (about 1 in 4,000 interrupted updates) rests on three failures, so the true rate could be higher; a one-sided 95% upper limit is about 1 in 1,500.
  - Even at that limit, if every one of the 180,000 updates lost power at a random moment, about 120 meters would fail: about $22,000 in visits, plus the customer's goodwill. If, say, one update in a thousand saw a power cut, the expected number would be well under one meter.
  - Aiko's two-stage update, which Lena has not looked at, would make a power loss during the swap fall back to the old image. It must itself be installed by the old bootloader, so the staged rollout still matters for that one update.

6.2 One defensible opening

For the Tuesday meeting, Lena might open like this:

> **"I recommend we ship 4.2 on time with a safer update method Aiko has proposed, and roll it out in stages. We have enough data on the boot fault to decide today; more modelling won't change the answer. Here's the plan, the stop rule, and what we tell the customer."**

It makes a decision, credits the engineer whose idea it is, and says why further analysis is not needed.

6.3 A worked plan

Table 6.1 sets out one plan for Lena's next few weeks.

Table 6.1: One plan for Lena's next few weeks.

When	Action	Chapter
Fri 8 Oct	Stop the three-week modelling. Review Aiko's two-stage design with her; estimate whether it can ship with a staged rollout before 1 November	5
Tue 12 Oct	Recommend: build the two-stage update (Aiko leads; the flash driver waits until after the release) and tell the customer the plan the same day	5
13–22 Oct	Aiko builds and tests the two-stage update (about eight days); Lena reviews	3
12–15 Oct	Private conversations: apologise to Jordan for the public comment and give task-level feedback; tell Marc the truth about the cellular-module transfer and a date. Set up a review rota	3, 4
25–29 Oct	Release 4.2 to 1% of meters on Monday 25 October, 10% on Wednesday and the rest on Friday 29 October, pausing automatically if any meter fails to report back	5
Early November	Give the flash driver back to Aiko with the authority to decide the design. At the leads' meeting, show Rob the pilot data, propose a team measure of escaped defects and on-time delivery, and ask that any discretionary share be small and announced	3, 5
Every week	Hold all five one-on-ones; protect them first in her calendar	3

The one-sentence version of this lecture. When you become a lead, give away the work that made you good, keep your respect steady and your boundaries clear, reward the result rather than the measure, and decide as soon as more analysis would no longer change the answer.

Glossary

80/20 rule Zelnick's rule that about 20% of the work yields 80% of the information needed for a sound decision (p. 117).

24-hour rule Taking a day before a decision that has no clear path, then deciding and not second-guessing (p. 119).

Crowding out Usually, the reduction of intrinsic motivation by external incentives; in Cerasoli et al. (2014), the weakening of intrinsic motivation's link to performance when incentives are tied directly to performance.

Delegation Assigning a task together with the authority to make decisions within it, while still exacting accountability for results (Morse et al., 2020, p. 387).

Discretionary compensation Pay decided by a manager's judgement rather than by a formula.

Dual career ladder Parallel technical and management career tracks with equivalent levels (Morse et al., 2020, p. 383).

Empowering leadership Leadership that shares authority, encourages autonomy and develops capability (Lee et al., 2018).

Leader–member exchange (LMX) The quality of the working relationship between a leader and each team member (Gerstner and Day, 1997).

One-on-one A regular private meeting between a lead and one team member.

Over-the-air (OTA) update A software update delivered to a device through its network connection.

Peter principle The idea that people are promoted on performance in their current role until they reach a role they cannot do well, named by Peter and Hull (1969) and tested by Benson et al. (2019).

Staged rollout Releasing an update to a small share of devices first, widening it only if no problems appear.

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 6. Its job is to show engineering students that leading is a different job from engineering, and that its core habits — delegating, keeping commitments, giving feedback, designing incentives and deciding — can be learned. Materials: printed copies of Exhibits 1–4, and a board for Figures 3.1, 5.1 and 5.2.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Show Exhibit 1. Ask: what job is Lena doing? Vote: ship 4.2 on 1 November, or delay?
10–30	Doing to leading	Sort Exhibit 1 into Figure 3.1 with the class. Cover the Peter-principle myth check and the dual ladder.
30–50	People	Rewrite Lena's comment to Jordan in pairs (Table 4.1). Role-play Lena's conversation with Marc.
50–65	Incentives and decisions	Ask what the pilot would show after a year; draw Figure 5.1. Walk 4.2 through Figure 5.2.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); hand out the Leadership Plan (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: a senior engineer's job with a lead's title. Q2: Marc — her word lapses; Jordan — respect is conditional; Aiko — hard work is taken away. Q3: more tickets, lower quality, more gaming; see the pilot. Q4: nearly; she needs a look at Aiko's design and a rollout plan, not more modelling. Q5: to Marc, "I said in July I'd look into the cellular-module move and I didn't. That's on me; here's where it stands and when you'll hear." To Jordan, "I was wrong to criticise your work in front of the team. Can we go through the retry logic together?"

Chapter 3

Q1: both; organisations should train new leaders, and leaders must choose to change. Q2: the engineer learns less, the lead becomes the bottleneck, and the task returns. Q3: equal pay and status, real technical authority, rigorous criteria. Q4: a strong answer names a reason that fits the student, not just pay or status.

Chapter 4

Q1: it helps on steadiness; it offends if it implies adults are children. Q2: harder; she should hold him to the same standard and deliver it privately. Q3: specificity, privacy and respect transfer; the long run-up of compliments may not suit a routine review. Q4: a strong answer names a specific boundary and the exact words, as Zelnick does.

Chapter 5

Q1: formulas miss contributions that are hard to measure; small, announced discretion can fill that gap. Q2: participation marks and word counts are common examples; a strong answer shows how the measure can rise while learning does not. Q3: safety-critical analysis, certification evidence, anything irreversible. Q4: likely "fix first" or "release in stages"; it changes if the two-stage design cannot be tested in time.

Marking guidance

A strong Part 1 delegates a real task with real authority. A strong Part 2 closes open commitments and shows feedback about the work, not the person. A strong Part 3 identifies how a measure could be gamed before anyone games it. The three parts total 40 marks.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. "Managing people is like raising children" (p. 96) is an analogy for steadiness and clear limits; the two principles are what students should carry into leading adults.
2. His Time Life plan adjusted junior managers' bonuses by review because they could not move profit on their own (p. 108), a thoughtful design; the evidence adds that incentives tend to raise quantity more than quality (Jenkins et al., 1998), which is worth knowing when designing any bonus.
3. The 80/20 rule (p. 117) is a heuristic for moving decisions along. In safety-critical engineering the last 20% of analysis can be the part that matters, so teach students to ask which 20% they are skipping.

None undermines his argument, and spotting them models the habit of checking sources.

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University of Ottawa
Faculty of Engineering — Capstone Design Program

Success as an Engineer — Professional Practice Series

Lecture 8

The Business Behind the Engineering

Cash, customers and the company you work for

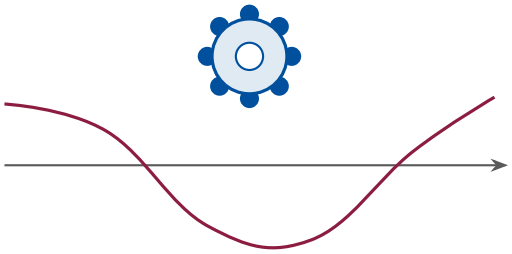
Audience: Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering

Base texts: Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)

Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)

Case study: The Big Customer (robotics start-up)

Year: 2026



engineering runs on cash

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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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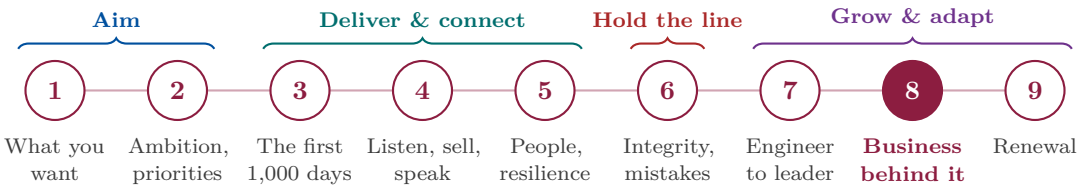
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Chapter 1

About This Lecture



Every engineering decision is also a business decision. A design that is technically right can still sink the company that builds it if it ties up cash the company does not have, depends on one customer who can walk away, or is priced below what it costs to support. Engineers who understand the numbers behind their work make better designs, better arguments and better career choices — including the choice of which company to work for.

Learning objectives

By the end of this lecture you will be able to:

- **Explain** Zelnick's claim that business comes down to investment, cost of capital, revenues, costs and free cash flow, adjusted for risk and time.
- **Show** why a profitable, growing company can still run out of cash, and sketch a simple cash forecast for an engineering decision.
- **Assess** the risks of customer concentration, seasonality and debt, and weigh the evidence on customer concentration.
- **Recognise** escalation of commitment, and separate sunk costs from future ones.
- **Judge** a prospective employer by the economics of its business, and a personal investment in it by how much you can afford to lose.
- **Build** your *Business Case File*: three short parts, built across the chapter assignments, for a real decision on your capstone, club or co-op.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: "A Handful of Business Lessons" and "The Quality of a Career Reflects the Quality of the Underlying Business".

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering context: the gap between an engineering education and commercial understanding, and the financial responsibility that comes with moving into management.

Research, mostly peer-reviewed and including two practitioner articles, tests both. It covers

customer concentration, growth and cash, escalation of commitment, strategy execution and the careers of graduates who start in a downturn.

1.2 The boxes in this lecture

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now.
Capstone move	One concrete thing to try on your capstone this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Takeaway (shaded bar)	The one-sentence summary, at the end of the lecture.

Reading plan (about 85 minutes) and the Business Case File

Read the case study (Chapter 2, 15 minutes) first and decide what *you* would do in Chloé's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Business Case File**: Part 1 (a cash forecast for an engineering decision, due at the end of week 1), Part 2 (a risk review of the same decision, due at the end of week 2) and Part 3 (an employer assessment and a personal exposure check, due at the end of week 3). No accounting background is assumed; the key terms are in the Glossary.

Chapter 2

Case Study: The Big Customer

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2027.

2.1 Friday 3 December 2027, 6:15 p.m.

Chloé Tremblay sat in a meeting room at Kinetra Robotics in Hamilton, Ontario, with a spreadsheet open and two decisions in front of her. The chief executive, Dev Anand, wanted the engineering team's view on a deal with the company's largest customer by Monday's board meeting. And he had made Chloé an offer that would put her own savings into the company.

2.2 The company

Kinetra builds autonomous pallet-moving robots for warehouses. It has 24 employees and sells each robot for $85,000; each costs about $52,000 to build. Chloé, a mechatronics graduate and engineer-in-training (EIT), had joined two years earlier and now led the navigation and safety software. Kinetra had raised $6 million from investors in 2025 and had never made a profit.

Exhibit 1 shows where its revenue came from in 2027.

Exhibit 1 — Kinetra revenue by customer, January to November 2027

Customer	Revenue ($000)	Share
Brightway Logistics (grocery distribution)	4,544	71%
Fenwick Foods	704	11%
Orla Pharma	512	8%
Seven smaller customers	640	10%
Total	6,400	100%

Revenue includes robots, service contracts and software licences. Brightway's current supply agreement ends on 31 July 2028. About 60% of its orders arrive between August and October, ahead of the holiday season.

2.3 The offer from Brightway

On 18 November Brightway's head of operations sent a proposal (Exhibit 2).

Exhibit 2 — Brightway's proposal, 18 November 2027 (summary)

- 40 new robots, delivered June to September 2028, at $74,800 each (a 12% discount).
- A cold-storage variant that works at −25 °C, which Kinetra does not yet make.
- Payment 120 days after delivery for the 40 new robots (the current contract, which also covers existing orders, pays in 60).
- In return, a three-year agreement — and Kinetra may not sell to any other grocery distributor during it.

Chloé's team estimated that the cold-storage variant would take six engineers about five months, at a loaded cost of about $360,000 — about $72,000 a month from January to May. Because the roadmap work those engineers would otherwise do would be contracted out, that cost is on top of the monthly burn. Dev had asked the finance lead, Grace Obi, for the cash picture (Exhibit 3).

Exhibit 3 — Grace Obi's cash notes, 30 November 2027

- Cash in the bank: $1.35 million. Net cash burn: about $150,000 a month on average, assuming Brightway renews on current terms.
- Runway: nine months from December. Without new money we run out in August 2028, even without the deal.
- Cold-storage engineering, if we take the deal: about $72,000 a month, January to May.
- If we take the deal: we pay suppliers for the 40 robots ($2.08 million) from April to July, about 60 days before each batch ships, and Brightway pays from October to January.
- Proposed financing: a $2.5 million bridge note from existing investors, plus a $1 million bank line of credit. The bank wants personal guarantees from Dev and the other co-founder.

2.4 The offer to Chloé

That afternoon Dev had asked Chloé to become head of engineering (Exhibit 4).

Exhibit 4 — Dev's offer to Chloé, 3 December 2027

- Title: Head of Engineering. Salary cut from $98,000 to $78,000 for twelve months, "until the bridge closes and Brightway pays".
- Stock options for 1.5% of the company, vesting over four years.
- "We're offering the leadership team a chance to join the bridge note. I'd love you to put in $40,000 — it shows the investors the team believes." Chloé's savings total about $60,000.

She had built the navigation stack. She believed in the product. She also noticed that every number on the table depended on one customer.

Discussion questions

Before reading further, write a short answer to each question.

1. What share of Kinetra's future depends on Brightway, before and after the proposed deal?
2. From Exhibits 2 and 3, what happens to Kinetra's cash if it takes the deal and raises no new money?
3. What does the exclusivity clause cost Kinetra, even if the deal goes well?
4. Should Chloé put $40,000 into the bridge note? What would you want to know first?
5. What should the engineering team tell the board on Monday?

We return to Chloé in Chapter 6.

Chapter 3

Follow the Cash

3.1 What business comes down to

Zelnick's argument

"Value creation (and destruction) in business ultimately comes down to a handful of important commercial decisions. The most important one is whether, and how much, to invest. Subsequent decisions can only enhance or mitigate that original crucial decision" (p. 89). His summary is one sentence long: "Business ultimately comes down to investment, cost of capital, revenues, costs and free cash flow — adjusted for risk and time. Period" (p. 89).

He adds, of his own business school, that "I learned more about economics from my Hewlett-Packard 12C manual than I did in business school" (p. 89) — the 12C being a financial calculator.

Each of Zelnick's terms has a plain engineering meaning. Table 3.1 gives them, with Kinetra's numbers.

Table 3.1: The terms in Zelnick's summary sentence (p. 89), in plain language, with what each means for the Brightway deal in Chapter 2.

Term	Plain meaning	In the Brightway deal
Investment	Money spent now to earn money later	$360k of engineering; $2.08M of robots built before payment
Cost of capital	What the money costs, as interest or as a share of the company given away	Bridge note and bank line; dilution for existing owners
Revenues	Money customers agree to pay	40 robots at $74,800: $2.99M
Costs	Money spent to deliver	40 robots at $52,000: $2.08M
Free cash flow	Cash left after running the business and paying for investment	Monthly cash flow turns positive in October 2028; the deal's cumulative cash turns positive (+$0.55M) only with the last payment in January 2029
Risk and time	A dollar later, or an uncertain dollar, is worth less than a dollar now	Payment 120 days after delivery; one customer

What Morse, Schell & Babcock add: the engineer and the numbers

Morse, Schell & Babcock open their advice to new engineers with Henri Fayol's warning, written in 1916, that "college has given you no conceptions of management, nor of commerce,

nor yet of accounting, which are requisite for a manager" (Morse et al., 2020, p. 362). Citing Bill Coplin, they list "know your numbers" as one of the three skills employers most want, beyond the degree: "Engineers know their numbers, but make sure you understand your statistics. You need to understand your financials . . . " (Morse et al., 2020, p. 363). A comparison of roles by Amos and Sarchet, which they reproduce, makes the same point: the engineer "has limited concern for finances"; the engineer-manager "has fiscal responsibilities" (Morse et al., 2020, p. 385).

3.2 Profit is not cash

Zelnick's argument

"Once you've made an investment all of the risk and much of the ultimate opportunity has been crystallized. . . . However, people sometimes forget that many good ideas run into trouble and many otherwise sound businesses fail as a result of liquidity constraints or, said more plainly, running out of cash" (p. 90). "Running out of cash can ensure the destruction of even an exceedingly robust business" (p. 90). The failure of Lehman Brothers, he notes, "was triggered not by underlying business issues (although as it turns out those existed as well — unsurprisingly) but rather by an inability to refinance its enormous debt load" (p. 91).

The Brightway deal looks profitable: $2.99 million of revenue against $2.08 million of robot costs and $0.36 million of engineering. But the cash moves at different times. Kinetra pays its suppliers before each batch ships and is paid 120 days after delivery. Figure 3.1 shows what that does to the bank balance before any new financing.

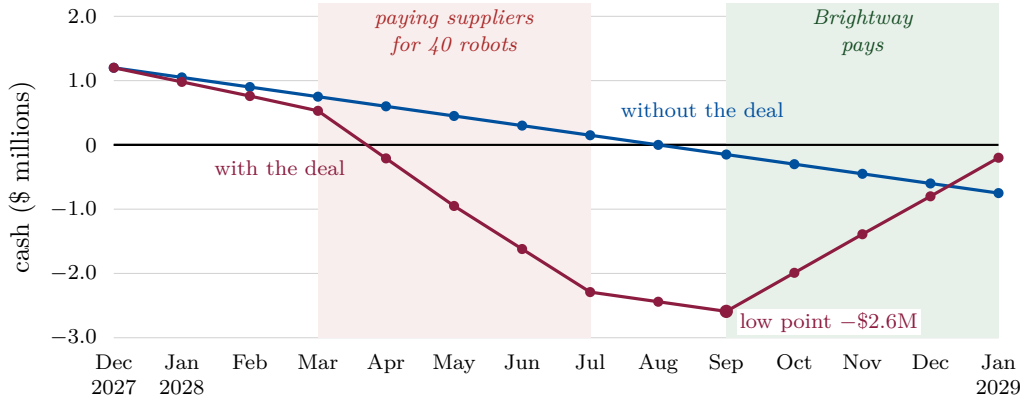


Figure 3.1: Kinetra's month-end cash balances (one point at the end of each month) before any new financing; shading spans the months in which payments flow. From Exhibit 3: $1.35 million at the start, $150,000 a month of net burn, the $360,000 of engineering spread over January to May, supplier payments of $520,000 a month from April to July and Brightway's payments of $748,000 a month from October. Without the deal, cash runs out in August 2028, so Kinetra must raise money either way; with it, cash goes negative in April. The deal adds $0.55 million of profit but, up to January 2029, raises the most Kinetra must borrow or raise from about $0.75 million (and still growing $0.15 million a month) to about $2.6 million.

What the research says: growth consumes cash

Churchill and Mullins (2001) explained why a profitable company that grows too fast can run out of cash: growth must be financed before it pays. How fast a company can grow on its own cash depends on how long its cash cycle is, how much cash each dollar of sales ties up and how much each dollar generates. Brightway's 120-day terms lengthen that cycle.

Engineering translation

Engineers control more of the cash cycle than they think. Design choices set the bill of materials, the lead time of long-lead parts, the build time and the number of engineering changes after launch — all of which decide when cash goes out. A simple month-by-month cash table like Figure 3.1, next to the engineering schedule, is often more persuasive in a design review than a net-present-value figure, because everyone in the room can check it.

3.3 Debt, equity and the cost of money

Zelnick's argument

"In boom times it's tempting to take on debt, especially if it's both readily available and inexpensive, as opposed to equity, which creates dilution. Why? Because debt is repaid only with interest, whereas equity is entitled to a share in the upside. When things go well, debt is generally much cheaper capital than equity. But debt is also risky for the equity investor, since in return for a lower cost of capital it earns a senior position in the capital structure" (p. 90).

Kinetra's financing plan uses both. The bridge note from investors will eventually convert into shares, diluting existing owners, including anyone holding options. The bank line is debt: the bank ranks ahead of every shareholder if the company fails, which is part of why debt is cheaper. But a loss-making start-up has few assets the bank could recover, so it asks the founders to guarantee the loan personally — the practice Zelnick warns against in Chapter 5.

Myth check: "If it's profitable on paper, it will pay for itself"

Engineers are trained to compare total benefits and total costs. The Brightway deal passes that test: about $0.55 million of profit. But "pays for itself" assumes the company survives until the payments arrive. Zelnick's point, and that of Churchill and Mullins (2001), is that timing can kill a profitable project. A project is only as good as the company's ability to fund it until it pays back.

Capstone move

For your capstone, list every purchase you still need to make, with the date you must order it and the date you will be reimbursed or funded. Plot the running balance month by month. Find the lowest point, and decide now what you will do if it is negative.

Discussion questions

1. Zelnick says the most important commercial decision is "whether, and how much, to invest" (p. 89). What is the investment decision in the Brightway deal, and who is really making it?
2. In Figure 3.1, which single change to Brightway's terms would help Kinetra's cash the most? Estimate the effect.
3. Why might a bank insist on personal guarantees from founders but not from investors?
4. Morse, Schell & Babcock, citing Coplin, say engineers "know their numbers". Which numbers in this case would an engineering degree prepare you to question, and which would it not?

Assignment — Cash forecast (Business Case File, Part 1)

Task. Choose a decision on your capstone, design team or co-op that involves spending money or time before a benefit arrives (a purchase, a prototype, a competition entry, a new test rig).

1. Describe the decision in Zelnick's terms, as in Table 3.1.
2. Build a month-by-month cash (or budget) forecast with and without the decision, and plot it like Figure 3.1.
3. Identify the low point, what causes it, and one engineering or scheduling change that would raise it.

Deliverable and due date. Two pages (PDF) plus the spreadsheet, due at the end of week 1.

Marking (10 marks).

- *Terms* (3): all six terms applied with numbers (3); four or five (2); fewer (1); missing (0).
- *Forecast* (4): both cases, monthly, with stated assumptions and a plot whose points match the table (4); assumptions missing (3); one case only (2); totals without timing (1); missing (0).
- *Low point* (3): cause and a specific, costed change (3); change not costed (2); low point only (1); missing (0).

Chapter 4

Risks That Engineers Can See

4.1 Customer concentration

Zelnick's argument

"A dirty little secret of many deals that appear cheap is that the enterprise's revenues are driven by less than a handful of customers. This is known as 'customer concentration' " (p. 92). Zelnick's firm looked at a company whose revenues came largely from Walmart under a contract of less than two years (p. 92); the seller assured them the product "could never be efficiently duplicated by anyone else, and therefore, despite customer concentration, the company was protected. We passed" (p. 93). Years later, just before the buyer tried to sell the company, Walmart did not renew. "The company's projected earnings fell by 80 percent. The auction failed and the owner lost its entire investment. Ouch" (p. 93).

Brightway already provides 71% of Kinetra's revenue (Exhibit 1), under a contract that ends in July. The proposed deal would raise that share, lengthen the dependence to three years, and — through exclusivity — close off the rest of the grocery market in which Kinetra's product has proved itself.

Figure 4.1 shows Kinetra's revenue mix now and under the deal. If Brightway left, only 29% of today's revenue would remain, and about 20% under the deal.

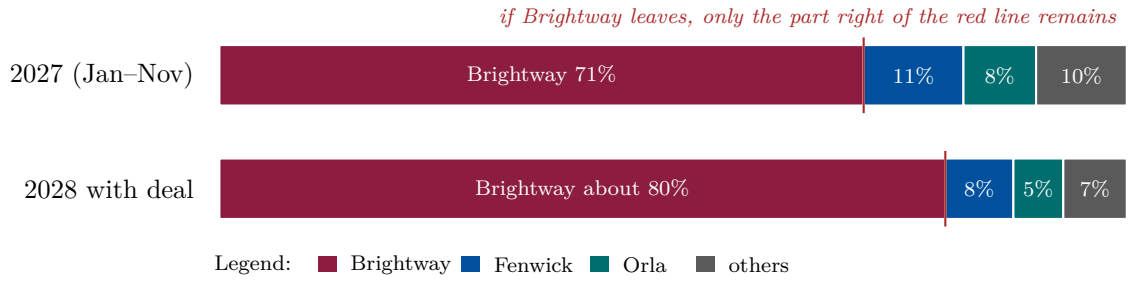


Figure 4.1: Kinetra's revenue by customer in 2027 and, roughly, in 2028 if it takes the deal. The 2028 bar assumes Brightway renews its current business and adds the $2.99 million deal, with other customers flat (Fenwick about 8%, Orla about 5–6%, others 7%; the 2027 figures cover January to November). Under exclusivity Kinetra also could not replace Brightway with another grocery distributor for three years.

Myth check: "A big customer is always a risk to avoid"

The evidence is more balanced than the slogan. A study of US firms found that those with concentrated customer bases tended to be *more* efficient, with lower operating expenses and better use of assets, perhaps because a few large customers make planning easier (Patatoukas, 2012). But investors charge such firms more for capital: concentrated firms faced a higher cost of equity, especially when they were more likely to lose a major customer or would lose more if they did (Dhaliwal et al., 2016). A large customer can be good for operations and still be a serious risk. The question is not whether to have one, but what happens the day it leaves.

4.2 Seasonality and diversification

Zelnick's argument

Avoid seasonality. "Seasonality vastly increases risk and therefore it should be avoided. If you insist on buying or working for a seasonal enterprise, … avoid taking on debt, so you can survive one or two bad periods" (p. 94). At Lillian Vernon, almost three-quarters of revenue and all of the profit came in the fourth quarter, so "decisions to improve results could only be tested once a year" (pp. 94–95).

Diversify. "It has been said that fortunes are built through focus and preserved through diversification" (p. 91). "Note that this principle usually applies to an enterprise and always applies to one's personal financial decisions" (p. 91).

Kinetra has both problems at once: about 60% of Brightway's orders arrive between August and October (Exhibit 1), and the proposed debt would be drawn from April, while the company waits until October for Brightway's payments. A late or smaller autumn order would arrive with the bank line largely drawn. And diversification, which Zelnick says "usually applies to an enterprise", is exactly what the exclusivity clause would forbid in Kinetra's strongest market.

4.3 Strategy once a year, execution daily

For an engineering team, the next point is the most practical in the chapter: most of the value is won or lost after the decision, in delivery. If the cold-storage variant slips by a month, so do the deliveries and, 120 days later, Brightway's payments.

Zelnick's argument

"While most people like to talk about setting business strategy, it is at best an infrequent exercise — once a year is a good benchmark — unless something significant has changed" (p. 93). "What really matters then is to: manufacture a great product while also innovating; manage costs so you can offer your product at a competitive price; run an aggressive and effective sales department; fill orders accurately and efficiently; and offer a high level of customer service. All of that is driven by day-to-day execution" (pp. 93–94).

What the research says: strategies lose value in execution

Surveying large companies, Mankins and Steele (2005) reported that strategies delivered, on average, only about 60% of the financial value their plans promised. The authors trace much of the shortfall to how plans were resourced and carried out. That is Zelnick's point in numbers. For Kinetra, a deal won in December is only worth what the team delivers, on time and to specification, between June and September.

4.4 When to stop: escalation of commitment

What the research says: people throw good money after bad

- **Responsibility breeds escalation.** In a classic experiment, business students who were personally responsible for an investment that had gone badly committed *more* money to it than those who had not made the original decision; commitment was highest when they were responsible and the outcome was bad (240 participants; Staw, 1976).
- **It is a general pattern.** A meta-analysis of the research that followed reviewed the determinants of escalation and confirmed it is not confined to one kind of decision (Sleesman et al., 2012).

Escalation matters for Kinetra because the cold-storage variant is itself an investment. Once $200,000 of engineering has been spent, the pressure to finish it — and to accept whatever terms Brightway then offers — will grow. Figure 4.2 is a check an engineering team can use at each milestone.

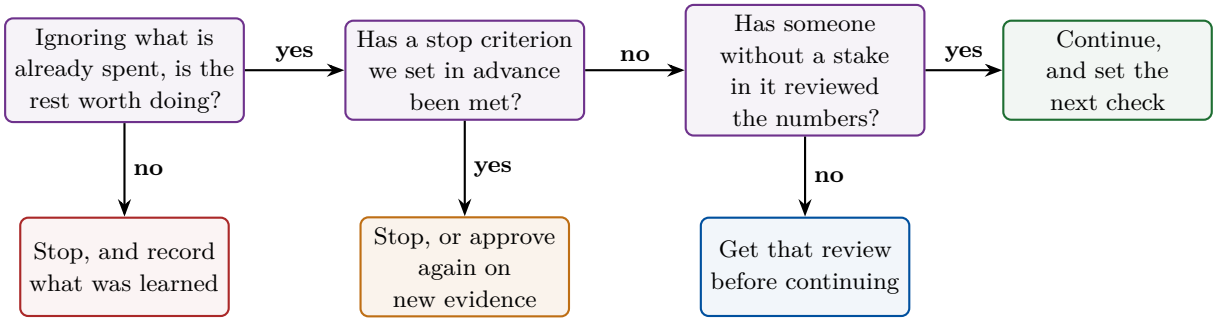


Figure 4.2: A milestone check against escalation of commitment, built for this lecture from the research of Staw (1976) and Sleesman et al. (2012). The first question sets aside money already spent; the second holds the team to limits it set before the pressure arrived.

2026 context: one customer, one platform

By 2026, concentration risk for engineers often comes from platforms as well as customers: a product that depends on one cloud provider, one app store, one chip supplier or one AI model's interface can lose its market or its margin when that partner changes terms. The questions in this chapter apply to suppliers and platforms as much as to customers: what share of the business depends on them, how long is the commitment, and what happens the day they change the terms.

Capstone move

List your capstone's single points of failure — a part from one supplier, a sponsor who funds everything, a teammate who alone understands a subsystem. For the most serious one, write what you would do the week it disappeared.

Discussion questions

1. Patatoukas (2012) found that concentrated firms can be more efficient. Does that weaken Zelnick's warning, or refine it?
2. Which clause of Brightway's proposal would you most want to change, and what would you offer in return?
3. Zelnick says strategy is "at best an infrequent exercise" (p. 93). Is a start-up an exception?
4. Where have you seen escalation of commitment on a team project? What would have stopped it?

Assignment — Risk review (Business Case File, Part 2)

Task. For the decision you chose in Part 1:

1. Identify its concentration risks (customers, sponsors, suppliers, platforms or people), with the share of the outcome each controls.
2. Identify any seasonal or timing risk, and what happens if the key period goes badly.
3. Apply Figure 4.2 to the decision as it stands today.
4. Recommend one change that reduces the largest risk, and estimate what it costs.

Deliverable and due date. Three pages (PDF), due at the end of week 2.

Marking (15 marks).

- *Concentration* (5): all significant dependencies, each with a share and a failure scenario (5); shares missing (4); scenarios missing (3); one dependency only (2); generic (1); missing (0).
- *Timing* (3): a specific risk with its consequence (3); risk without consequence (2); generic (1); missing (0).
- *Sunk-cost check* (3): all three questions answered, each with evidence (3); two (2); one (1); missing (0).
- *Recommendation* (4): specific, costed and aimed at the largest risk (4); not costed (3); aimed at a lesser risk (2); generic (1); missing (0).

Chapter 5

Your Career Is a Stake in a Business

5.1 The quality of the underlying business

Zelnick's argument

At Twentieth Century Fox, Zelnick had "a job lots of people felt they'd like to have". "And yet I chose to leave voluntarily just four years later, taking a 95 percent pay cut, to join a raw, untested start-up … in a business I didn't know (video games). Why? Because I came to understand the underlying economics of the motion picture business" (p. 101): high capital requirements, volatile results, poor cash flow and almost no barriers to entry. He quotes Warren Buffett: "When a management with a reputation for brilliance tackles a business with a reputation for bad economics, it is the reputation of the business that remains intact" (p. 102).

"If you want stability in a job, you can't join a volatile company or work in a risky industry. If you want to make a lot of money, you can't join a low-margin company with poor (or negative) cash flow. The best you can hope for in any career is that you'll do as well as the company for which you work. Hoping for anything more than that is a fool's errand" (p. 102).

For engineers, this reframes the job search. Choosing an employer is choosing an investment: your time, your skills and, often, part of your pay in options. Table 5.1 turns Zelnick's criteria into questions a candidate can ask.

Table 5.1: Questions for judging the business behind a job offer, based on Zelnick's criteria (pp. 89–102), with Kinetra's answers from Chapter 2.

Criterion	Question to ask	Kinetra
Cash and runway	How many months of cash does the company have, and when does it next raise money?	Nine months; raising now
Margins	What does the company earn on each unit after the cost of making it?	About 39% at list; 30% under the deal
Customer concentration	What share of revenue comes from the largest customer?	71%, rising to about 80%
Seasonality	Is revenue bunched in part of the year?	Largest customer orders mostly in August to October
Debt	How much does it owe, and who has guaranteed it?	A bank line guaranteed by the founders is proposed
Barriers to entry	What stops a competitor copying the product?	Navigation and safety software; not yet proven

What the research says: the business and the timing both shape a career

- **The horse matters more than the jockey.** Following 50 venture-backed firms from early business plans to public companies, Kaplan et al. (2009) found that their core lines of business stayed remarkably stable while their management changed a great deal. For investors, the business itself was the more durable asset — a finding that fits Buffett's line.
- **Starting conditions last.** Canadian university graduates who entered the job market in a typical recession earned about 9% less at first; the loss halved within about five years and faded after about ten, and it was larger and longer-lasting for those at the bottom of the earnings range (Oreopoulos et al., 2012). In a sample of white male US college graduates, the wage losses from graduating in a bad economy persisted for as long as they were measured (Kahn, 2010).

The two findings point the same way: which company, and which economy, you start in affects your career for years. Neither is fully under your control, but the first can be assessed before you accept an offer.

5.2 Never sign personally; never bet what you can't lose

Zelnick's argument

Never, ever sign personally. Apart from before you have any net worth, and for a home mortgage, "once you have any material net worth, you have no business signing personally. And if you violate this rule, just bear in mind that the debt you personally guaranteed really isn't debt. It's basically equity" (p. 95).

Two rules of thumb. "(a) never invest more than you can afford to lose in any one instrument or deal; and (b) never invest more than 10 percent of your net worth in any one instrument or deal. That way, chances are that if you get almost everything wrong, and you just may, you'll still be okay" (p. 92). "The only time in one's life to put all of your eggs in one basket is when you don't have any eggs" (p. 91).

Chloé's position already concentrates her risk: her salary, her skills and her options all depend on Kinetra, and Kinetra depends on Brightway. Dev's request would add two-thirds of her savings to the same bet. Figure 5.1 shows how much of her finances would ride on one company.

Myth check: "Putting your own money in shows you believe in the company"

It can show belief; it does not show judgement. When employees of US public companies choose how much of their retirement savings to hold in their employer's stock, they tend to put more in after the stock has done well, yet those past returns did not predict future ones (Benartzi, 2001). Zelnick's rules are about survival, not conviction: if a single bet fails, you should "still be okay" (p. 92). An employee already has the most undiversified stake in the company there is — their job. Declining to invest savings on top of that is not disloyalty; it is the diversification Zelnick says "always applies to one's personal financial decisions" (p. 91). A good employer will accept a clear, polite no.

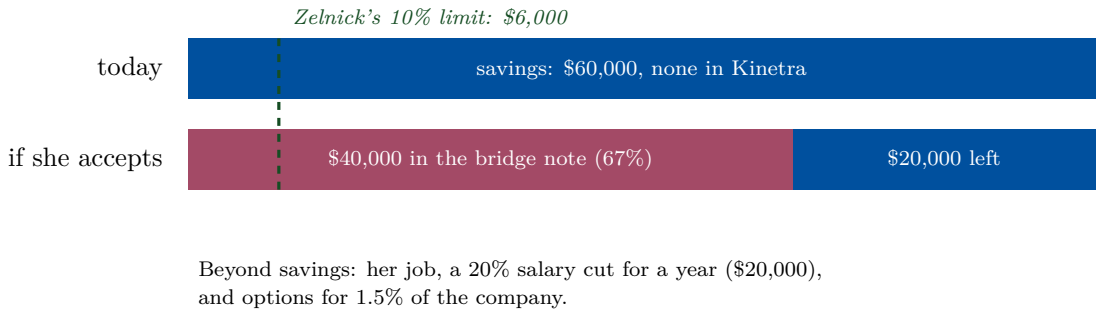


Figure 5.1: Chloé's savings today and if she accepts Dev's request (Exhibit 4), against Zelnick's 10% rule (p. 92), using savings as a stand-in for her net worth. Her salary and options are already concentrated in the same company.

Engineering translation

Engineers can read an offer the way they read a datasheet. Salary is the rated value; options are a value that depends on conditions (the company's survival and a future sale or listing); a salary cut in exchange for options is a trade of certain value for conditional value. Before accepting, ask for the numbers that let you model it: the number of shares outstanding, the price of the last round, the exercise price and the vesting schedule. If the company will not share them, that is also data.

Capstone move

Pick a company you would like to work for after graduation. Using its website, filings or news coverage, answer as many of the questions in Table 5.1 as you can in thirty minutes, and note which ones you would ask in an interview.

Discussion questions

1. Zelnick took a 95% pay cut to join a start-up (p. 101). How is that different from what Dev is asking of Chloé?

2. "The best you can hope for in any career is that you'll do as well as the company for which you work" (p. 102). Is that true for engineers, whose skills can move between companies?

3. Given Oreopoulos et al. (2012), what should a graduate do differently when the job market is weak?

4. Is it fair for a founder to ask employees to invest? What would make the request fair?

Assignment — Employer assessment and exposure check (Business Case File, Part 3)

Task.

1. Assess a real prospective employer (or your current co-op employer) using Table 5.1, citing a source for each answer or marking it "to ask".
2. Write the three questions you would ask about its business in an interview.
3. Draw your own exposure chart like Figure 5.1 for a realistic offer from that employer (you may use invented numbers for your finances).
4. Write a one-paragraph introduction to your *Business Case File* linking Parts 1–3.

Deliverable and due date. Three pages (PDF), due at the end of week 3.

Marking (15 marks).

- *Assessment* (6): all six criteria, each sourced or marked "to ask" (6); five (5); four (4); three (3); one or two (2); unsourced opinion (1); missing (0).
- *Interview questions* (3): three questions, all specific and answerable (3); two such questions (2); generic (1); missing (0).
- *Exposure chart* (5): savings charted against the 10% test, income and options noted, and a decision (5); decision missing (4); options missing (3); savings only (2); sketch without numbers (1); missing (0).
- *Introduction* (1): links Parts 1–3 (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Chloé or Kinetra what to do on Monday; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 shows concentration of the kind Zelnick warns about (p. 92).** One customer provides 71% of revenue under a contract that ends in eight months, with most of its orders in one season (Chapter 4).
- **Exhibit 2 trades price, terms and freedom for volume.** The discount cuts the margin from about 39% to about 30%; 120-day terms lengthen the cash cycle; exclusivity closes the rest of the grocery market for three years (Chapters 3 and 4).
- **Exhibit 3 shows a profitable deal that Kinetra cannot fund alone.** Without new money Kinetra runs out of cash in August 2028 anyway. The deal adds about $0.55 million of profit but, up to January 2029, raises the most Kinetra must find from about $0.75 million (and growing) to about $2.6 million (Figure 3.1), and the financing adds debt guaranteed personally by the founders.
- **Exhibit 4 asks Chloé to concentrate further.** Her job, a year of reduced pay, her options and two-thirds of her savings would all depend on one company that depends on one customer (Chapter 5).

6.2 One defensible opening

For the board meeting, Chloé might open like this:

> **"Engineering can build the cold-storage variant in five months. We need to raise money whether or not we take the deal. The deal is profitable, but on these terms it raises the most we must find before January 2029 from about $0.75 million to about $2.6 million, and it ties us to one customer for three years. We recommend accepting only with a 30% deposit on signing, 60-day payment and a narrower exclusivity clause."**

It gives the engineering answer, states the cash and concentration risks in numbers, and makes a specific recommendation. The recommended terms matter: a 30% deposit on signing (any time before April) plus 60-day payment would lift the low point from about −$2.6 million to about −$1.4 million, in July.

6.3 A worked plan

Table 6.1 sets out one plan for Chloé and the engineering team.

Table 6.1: One plan for Chloé's next few months.

When	Action	Chapter
Sat 4 Dec	Rebuild Figure 3.1 with Grace; add a case where Brightway pays 60 days late	3
Mon 6 Dec	Board: support the deal *only* with changed terms — 60-day payment, a 30% deposit on signing, exclusivity limited to cold storage and one year; present the cold-storage variant as a product for other customers too	3, 4
Mon 6 Dec	Propose a sunk-cost check (Figure 4.2) at each engineering milestone of the variant	4
This month	Accept the role; negotiate the salary cut down or tie its end to a date, and ask for the option terms in writing	5
This month	Decline to invest $40,000; if she wants to show support, invest no more than 10% of her savings ($6,000)	5
Next quarter	With sales, build a pipeline of three non-grocery customers to reduce concentration	4

The one-sentence version of this lecture. Judge every engineering decision by when the cash moves as well as how much, watch for dependence on one customer, one season or one source of funding, and treat your own career and savings as investments that need the same diversification.

Glossary

Barriers to entry Features of a market that make it hard for competitors to enter.

Bill of materials The list of parts and their costs needed to build one unit.

Bridge note Short-term funding from investors, usually converting into shares at the next funding round.

Burn (net cash burn) The amount by which cash falls each month.

Cash cycle The time between paying for inputs and being paid by customers (Churchill and Mullins, 2001).

Cost of capital The return that lenders or investors require for providing money.

Customer concentration Dependence on a small number of customers for most revenue (Zelnick, 2015, p. 92).

Deposit Part of the price paid when an order is placed, before delivery.

Dilution The reduction in existing owners' percentage when new shares are issued.

Equity Ownership shares in a company; equity holders are paid after lenders.

Escalation of commitment Continuing to invest in a failing course of action, often because of what has already been spent (Staw, 1976).

Exclusivity A contract term that prevents a supplier from selling to competitors of the customer.

Free cash flow Cash generated by the business after operating costs and investment.

Gross margin Revenue minus the direct cost of the product, as a share of revenue.

Line of credit A bank facility the company can draw on up to a limit, repaid with interest.

Liquidity Having enough cash, or access to it, to meet obligations when they fall due.

Loaded cost The full cost of an employee's time, including salary, benefits and overhead.

Net present value The value today of future cash flows, discounted for time and risk.

Payment terms The number of days after delivery by which a customer must pay.

Personal guarantee A promise by an individual to repay a company's debt if the company cannot.

Runway The number of months a company can operate before its cash runs out.

Seasonality Revenue or orders concentrated in part of the year (Zelnick, 2015, p. 94).

Stock option The right to buy a company's shares at a fixed (exercise) price, usually vesting — becoming usable — over several years.

Sunk cost Money already spent that cannot be recovered and should not drive future decisions.

Instructor Notes

Purpose and timing

This 80-minute session follows Lecture 7. Its job is to show engineering students that the business behind their work — cash, customers, debt and risk — shapes both engineering decisions and their own careers, and that the basic numbers are within their reach. Materials: printed copies of Exhibits 1–4, a spreadsheet version of Figure 3.1 to project, and a board for Table 5.1.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Vote: take the Brightway deal as offered? Should Chloé invest?
10–30	Cash	Build Figure 3.1 live in a spreadsheet; change the payment terms to 60 days and watch the low point move. Cover the "profitable on paper" myth check.
30–50	Risk	Draw Figure 4.1. Discuss the concentration evidence in both directions. Walk the cold-storage variant through Figure 4.2.
50–65	Career	Groups fill in Table 5.1 for an employer they know. Draw Figure 5.1 and apply the 10% rule.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote and ask who changed and why (4 minutes); hand out the Business Case File (3 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: 71% now; about 80% of revenue and three years of dependence with the deal. Q2: cash goes negative in April and falls to about −$2.6 million in September before Brightway pays; without the deal the low is about −$0.75 million by January 2029 (Figure 3.1). Q3: the rest of the grocery market for three years. Q4: probably not $40,000; she should first ask about runway, option terms and what happens if Brightway leaves. Q5: see Chapter 6.

Chapter 3

Q1: the investment is building 40 robots and the variant before payment; the board decides, but engineering sets the cost and schedule. Q2: a deposit on signing helps most — 30% paid on signing, before April, would raise the low point by about $0.9 million; 60-day payment alone raises it by only about $0.3 million, because the supplier payments come first. Q3: the bank ranks ahead of shareholders and wants the founders' own assets behind the loan; investors have already accepted equity risk. Q4: cost and schedule estimates, yes; financing terms and dilution, usually not.

Chapter 4

Q1: it refines it — concentration can help operations and still raise the cost of capital and the

risk of loss. Q2: exclusivity or payment terms; offer a longer commitment or a small price concession in return. Q3: partly — a start-up may need to revisit strategy more often, but daily work is still execution. Q4: answers vary; a milestone check with an outside reviewer is the common fix.

Chapter 5

Q1: Zelnick chose to join and to cut his own pay after years as a senior executive; Chloé is being asked to add savings to an existing concentrated stake. Q2: partly; skills move, but options, pay growth and learning track the company. Q3: favour employers with strong economics, keep building skills, and be ready to move up as the market recovers. Q4: fair if voluntary, fully disclosed, sized so the employee could lose it, and declined without consequence.

Marking guidance

A strong Part 1 shows timing, not just totals. A strong Part 2 names who could walk away and what happens then. A strong Part 3 separates what the student knows about an employer from what they still need to ask. The three parts total 40 marks.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. "Avoid customer concentration" (p. 92) is an investor's rule, and research shows why it is priced: concentrated firms can be efficient (Patatoukas, 2012), yet investors charge them more for capital (Dhaliwal et al., 2016). An engineer can treat it as a risk to manage.

2. "The best you can hope for in any career is that you'll do as well as the company for which you work" (p. 102) is a reminder to choose employers well; an engineer's skills also travel between companies, which adds a second protection.

3. The 10% rule (p. 92) is written for people with savings to protect; for students with debt it becomes "invest nothing you cannot afford to lose".

None undermines his argument, and spotting them models the habit of checking sources.

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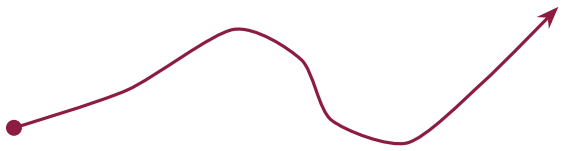
Success as an Engineer — Professional Practice Series

Lecture 9

Renewal

Left turns, endings and a whole life

Audience:	Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering
Base texts:	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
	Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)
Case study:	The Layoff (battery systems engineering)
Year:	2026



the path is rarely a straight line

Puranjan Gaur

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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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Chapter 1

About This Lecture

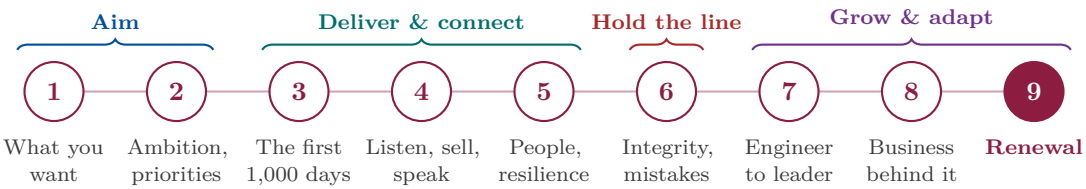


Figure 1.1: The nine lectures in the series, with this one highlighted. Each builds on the one before, and Lecture 1's Personal Setpoint returns here.

This is the last lecture in the series, and it is about what happens when the plan breaks. A career rarely rises in a straight line. Projects are cancelled, companies fail, jobs end, and sometimes the goal you set at twenty-two stops being the goal you want. This lecture is about changing direction on purpose, getting through the end of a job well, and keeping the rest of your life — health, friends, gratitude — in view while you do.

Learning objectives

By the end of this lecture you will be able to:

- **Decide** when a change of direction is a "left turn" worth making, and test it with small experiments before committing.
- **Prepare** for the end of a job before it comes, and handle it well when it does, including your rights under Ontario's employment standards.
- **Explain** what the research says about the effects of job loss and about what actually helps people find good work again.
- **Apply** Zelnick's personal advice — show up, help others, stay fit, be grateful, want what you have — and weigh the evidence behind it.
- **Revisit** the Personal Setpoint you wrote in Lecture 1 and turn it into a plan you can keep.
- **Build** your *Renewal Plan*: three short parts, built across the chapter assignments.

1.1 Three sources, one argument

Strauss Zelnick's *Success* (Zelnick, 2015) supplies the argument: "Be Willing to Make a Left Turn", "What Goes Around, Comes Around", "What Happens When Your Job Ends" and "And, Finally, Some Personal Advice" (pp. 139–161).

Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020)

supplies the engineering context: the stages of an engineering career, the insecurity of modern employment, and taking personal charge of your career.

Research, mostly peer-reviewed, tests both. It covers unemployment and well-being, job search, career change, social ties, physical activity, gratitude, income and happiness.

1.2 The boxes in this lecture

Box	What it contains
Zelnick's argument	The claim, in his words where short enough to quote, with page numbers from the 2nd edition.
What Morse, Schell & Babcock add	The engineering-management content that the claim organises.
What the research says	Evidence that supports, sharpens or limits the claim.
Myth check	A widely repeated claim that the evidence does not support.
Engineering translation	What the idea means for an engineer.
2026 context	What has changed recently and why it matters now (Chapters 3 and 4).
Note	A practical aside: reading plan, legal rights, and similar.
Capstone move	One concrete thing to try this week.
Discussion questions	For class; in the concept chapters, always just before the assignment.
Assignment	A task with a deliverable, a due date and marking criteria; it ends every concept chapter (Chapters 3–5).
Exhibit	Case material: the letter, the budget, the options, the notes and the handover note.
Takeaway (shaded bar)	The one-sentence summary, at the end of the lecture.

Reading plan (about 90 minutes) and the Renewal Plan

This lecture is given in week 1; the three parts of the Renewal Plan are due at the ends of weeks 2, 3 and 4. Read this chapter and the case study (Chapter 2, 20 minutes in all) first and decide what *you* would do in Ravi's place before reading on. Then read Chapters 3, 4 and 5 (about 20 minutes each) and Chapter 6 (10 minutes). The 80-minute class session in the Instructor Notes is separate from this reading time.

The three chapter assignments build one document, your **Renewal Plan**: Part 1 (a revised Personal Setpoint and two career experiments, due at the end of week 2), Part 2 (an ending plan, due at the end of week 3) and Part 3 (a whole-life plan: three weeks of habits followed by a reflection, due at the end of week 4). Some of this material is personal; you choose what to share, and nothing about your finances or health needs to be real to earn full marks. If the subject is close to home — a job lost in your family, or your own — your university's counselling and student-support services exist for exactly that.

Chapter 2

Case Study: The Layoff

Teaching case

This case is fictional. Names, companies and figures are invented for discussion; the situation is typical of what new engineering graduates describe. It is set in 2028, but the tax, Employment Insurance and employment-standards figures in it are those in force in 2026.

2.1 Friday 19 May 2028, 11:40 p.m.

Ravi Menon, 26, had written the email three times. It was addressed to the chief executive of Voltaris, the electric-vehicle start-up in Oshawa, Ontario, that had laid him off three days earlier, and it said exactly what he thought of the company's leadership. His cursor hovered over "Send".

2.2 Three years and eight months

Ravi had joined Voltaris in September 2024, straight out of an electrical engineering degree. By 2028 he led the battery management system for the company's delivery van: he owned the cell-balancing firmware, the state-of-charge estimator and the pack-level fault tree, and his last release cut the estimator's error from 6% to 2.5% across the temperature range. He was also three years and eight months into the four years of engineering experience he needs for his P.Eng. He had loved the work. He had also, he admitted, stopped doing much else: the gym, the Sunday football game, most calls from home. On Tuesday 16 May Voltaris announced that its second funding round had failed and cut 44 of its 110 staff, including the whole battery team. Exhibit 1 summarises his letter.

Exhibit 1 — Ravi's termination letter, 16 May 2028 (summary)

- Last day: 16 May. Length of service: 3 years and 8 months. Salary: $96,000 a year.
- Three weeks' pay in lieu of notice, as required by the *Employment Standards Act*, with his group health and dental benefits continued for those three weeks.
- Offered on top, if he signs a full release of claims by 30 May: a further four weeks' pay as a lump sum, and two more months of health benefits.
- His unvested stock options lapse. His vested options — 10,000 shares, about 0.1% of the company, at a strike price of $0.65 — can be exercised within 90 days, for $6,500 in total. The 2026 round priced the shares at $4.00; that round's investors have now declined to put in more.
- Accrued vacation pay, as the Act requires.
- His offer letter contains no clause limiting notice to the statutory minimum. Signing the release would not extend the 90-day window on the options.

2.3 The numbers at home

Exhibit 2 is the budget Ravi wrote that evening.

Exhibit 2 — Ravi's budget, 19 May 2028

Money coming in	Before tax	In hand, after 22% tax (assumed)
Savings (already taxed)	$11,000	$11,000
Pay in lieu of notice (3 weeks)	$5,540	$4,320
Extra pay if he signs the release (4 weeks)	$7,380	$5,760
Total	**$23,920**	**$21,080**

Money going out, each month	Amount
Rent $2,150; car loan $480; student loan $390; everything else $1,260	$4,280

- Pay figures are rounded to the nearest $10, and the flat 22% is a simplification: tax is withheld from a lump sum at a higher rate, while what Ravi finally owes depends on his whole 2028 income. Treat the after-tax column as an estimate.
- Ravi applied for Employment Insurance on 19 May. The case assumes the 2026 maximum, about $730 a week before tax and $570 after. Payments normally begin only after a one-week waiting period and after notice and release pay have been allocated to the weeks following the job's end.
- Exercising the options may also create a taxable benefit, though for a Canadian-controlled private company the tax is normally deferred until the shares are sold (Lecture 8).
- Exercising the vested options would cost $6,500 once, out of the cash above.
- Ravi's own note says: "Six months at most, less if I exercise the options."

2.4 Four doors

By Friday four possibilities had appeared (Exhibit 3).

Exhibit 3 — Ravi's options, 19 May 2028

Option	Details
A. Gridline Storage	Grid-scale battery company in Kitchener. A recruiter called on Thursday; a battery-management role at about $88,000, starting as soon as early July. First interview next week.
B. Master's degree	A one-year course-based MEng in power systems, starting in September; tuition about $18,000, paid from savings and loans; perhaps a part-time teaching-assistant job.
C. Kwame's start-up	A university friend building conversion kits for cargo e-bikes. Two employees, one pilot customer, and about seven months of runway. No salary for six months; 8% of the company.
D. Contract abroad	A former colleague offers a nine-month battery-validation contract in Germany, starting in July, at about €6,500 a month before German tax — roughly C$10,000 gross at about C$1.55 to the euro in May 2028, or about C$5,800 in hand after an assumed 42% of German tax and social contributions.

2.5 Friday night

Beside the draft email, Ravi had his notes (Exhibit 4), and a card he had kept since fourth year.

Exhibit 4 — Ravi's notes, 19 May 2028, and the card from fourth year

Notes:

- Three years of my life for a company that couldn't raise a round. What was the point?
- Tom's wedding is on 3 June in Kingston. I don't want to go and explain I got fired.
- Working 60-hour weeks since January. Haven't been to the gym since March. Sleeping at 3 a.m.
- Résumé still the 2025 one. No recruiters I know. Experience record not validated since 2026.
- EI claim filed — I qualify on hours, but the pay in lieu delays it.
- Gridline pays less. Is it a step back?

Card (fourth year, "Personal Setpoint"): *Values: build things that matter for the climate; stay close to family; keep learning. Goals by 30: lead a hardware team; live in Canada; run a marathon.*

Discussion questions

Before reading further, write a short answer to each question.

1. Should Ravi send the email? What would it cost, and what would it gain?
2. Using Exhibits 1 and 2 (after-tax figures), how many months can Ravi live on his cash, with and without the extra four weeks? Is his own "six months" right? What else would change the answer?
3. Which of the options in Exhibit 3 fits the card in Exhibit 4 best? Which fits it worst?
4. Should Ravi go to Tom's wedding?
5. What, if anything, has Ravi done wrong?

We return to Ravi in Chapter 6.

Chapter 3

Be Willing to Make a Left Turn

3.1 No gently upward-sloping curve

Zelnick's argument

"There will be times when you have to stop and reposition your goals. … [T]here's a pretty good guarantee that if you have real ambition, yours won't be a gently upward-sloping curve. In my case, I've always been willing to change course" (p. 139).

"Sometimes we do this because we've discovered the path we've taken doesn't compel us anymore. Sometimes we burn out. Sometimes we've just been mistaken in our career choice or played out our hand sooner than we thought. In these instances the wisest thing to do is to pause and reassess your values and goals. The exercise I describe at the beginning of this book is a *living* exercise: you can always edit or even erase your lists and start over" (p. 139).

"It requires a certain amount of courage to say 'I chose a trajectory, and it didn't work' or even, 'It did work, and yet, at this stage in my life, I'm making a different choice.' Better to muster up that courage than to stay mired in something that is no longer right for you" (p. 140).

The exercise Zelnick refers to is the list of values and goals from the start of his book — the *Personal Setpoint* in Lecture 1 of this series. Ravi still carries his (Exhibit 4). The layoff did not choose his next turn, but it has forced the question Zelnick says to ask periodically anyway: "is this the life I want?" (p. 140).

What Morse, Schell & Babcock add: careers are not one straight stage

Morse, Schell & Babcock describe Donald Super's classic sequence of career stages — growth, exploration, establishment, maintenance and disengagement — and note that Super and others later realised that "these stages may occur at widely varying ages": establishment "may be interrupted by a change in societal needs or a midlife crisis, resulting in reentry into the exploration stage" (Morse et al., 2020, pp. 366–367). They add that "very few positions can be considered 'secure jobs' in current employment practices" (Morse et al., 2020, pp. 361–362), and that each professional "needs to take personal charge of their career, and to determine its direction rather than letting events take their own course" (Morse et al., 2020, p. 383).

What Morse, Schell & Babcock add: staying current is part of renewal

Morse, Schell & Babcock warn that "individual engineers cannot and should not depend on their employer to combat obsolescence; they must take personal responsibility for their own career progress" (Morse et al., 2020, p. 374). They report Kaufman's finding that "there is consistent evidence that professionals who have taken graduate courses are perceived as less obsolescent by themselves, their supervisors, and their colleagues", that they are less likely to be laid off, and that those with a graduate degree are unemployed for a shorter period if they do lose their jobs (Morse et al., 2020, p. 375). They also note that, in one survey of 290 professionals, 42% named on-the-job problem solving as the most important source of professional growth and only 14% named formal coursework (Morse et al., 2020, p. 375), in a survey by Margulies and Raia that they report. Both routes bear on Ravi: the MEng (option B) is one way to stay current, and a demanding new job (option A or D) is another.

Myth check: "Work out who you really are, then make the change"

The usual advice for a career change is to plan first: reflect, identify your true calling, then act. In interviews with 39 professionals who had changed careers, Herminia Ibarra found that they had mostly worked the other way round. They tried things — side projects, short assignments, conversations with people in the new field — and let what they learned reshape their sense of what they wanted (Ibarra, 2003). Her earlier study of junior consultants and bankers describes the same mechanism: people assemble "provisional selves", try them out and keep what works (Ibarra, 1999). This is evidence from small qualitative samples, not a controlled trial, so treat it as a corrective rather than a law: reflection matters, but for a left turn it works best alongside small, real experiments.

Figure 3.1 draws the idea as a loop, and Table 3.1 applies it to Ravi's four options before he commits to any of them.

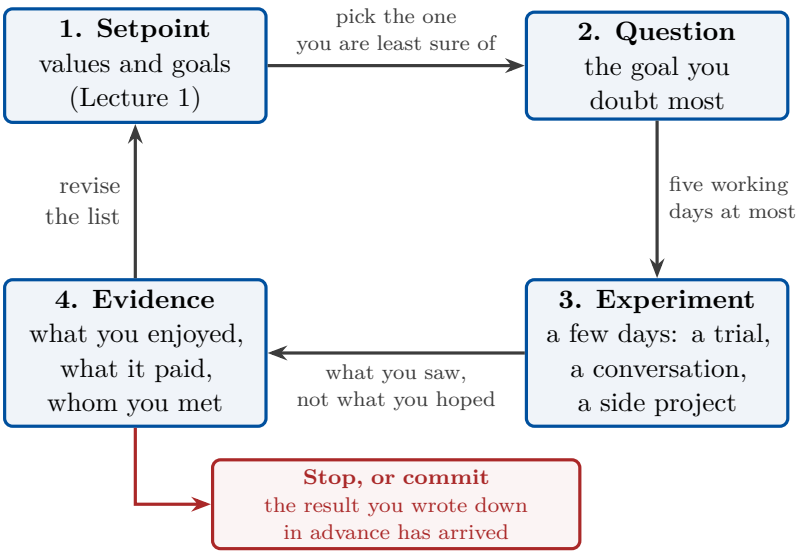


Figure 3.1: The left-turn loop: act, learn, then revise the list, and repeat until one direction is clearly best. Adapted from the account of career change in Ibarra (2003); Morse, Schell & Babcock note that career stages can re-enter exploration at any age (Morse et al., 2020, pp. 366–367).

Table 3.1: Small experiments to test each of Ravi's options (Exhibit 3) against the values on his card (Exhibit 4), after Ibarra (2003). Each costs days, not months, and each has a stopping rule written before it starts.

Option	A cheap experiment (five working days at most)	What it would show	What would stop him
A. Gridline	Do the interview; ask to meet the team lead and see the product roadmap	Whether the work is a step toward leading a team, and how directly it serves *for the climate*	No hardware of his own for two years
B. MEng	Sit in on one lecture; talk to two recent graduates about what the degree changed	Whether it adds skills he needs, or only delays a decision	Both graduates say it changed nothing
C. Kwame	Spend three days building a prototype with Kwame; ask for the cap table, the cash runway and the customers (Lecture 8)	Whether he enjoys it, and whether the business can pay him	No paying customer, or under six months of runway
D. Germany	Call two people on the team; list what staying close to family would cost	Whether the learning outweighs the distance	No route back to Canada after nine months

Write down, before each experiment, what result would make you stop: "if two graduates tell me the MEng did not change the work they were given, I drop option B". An experiment with no stopping rule is only a look around.

3.2 What goes around, comes around

Zelnick's argument

"Most of the time one gets back from the world what one puts into it. . . . If you're kind, you tend to associate with other kind people; if you're unpleasant, you'll repel nice people and attract unpleasant ones" (p. 141). When Zelnick's firm was new, a banker he calls Roger refused to show it a deal: "Who are you guys? Where's your capital? Why would I ever show you a deal?" Years later, Roger pitched for a sale mandate from one of the firm's companies. "Ask yourself: did we hire him?" (p. 142).

Ravi's draft email is his Roger moment. The executives who laid him off may one day hire him, invest in a company he joins, or be asked about him by someone who might. The engineering world in any one field is small, and a regional specialty such as battery systems is smaller still.

What the research says: the people you already know

Zelnick's advice has strong evidence behind it. Granovetter's study of how men in a Boston suburb found their jobs in the early 1970s reported that personal contacts were the commonest route, and that these were more often acquaintances than close friends (Granovetter, 1974) — the "weak ties" of his earlier paper, which reach into circles you do not already know (Granovetter, 1973). A large test of the idea, using experiments

on LinkedIn's "people you may know" feature across some 20 million people, found that moderately weak ties did the most for job mobility (Rajkumar et al., 2022). Former colleagues are such ties.

Engineering translation

For an engineer leaving a job, "what goes around" has a practical checklist. Hand over your work properly: a short note on the state of each design, where the files are, and what you would do next. Ask two colleagues you respect whether you may name them as references. Connect with former colleagues before you lose the company's contact list. None of it costs much, and all of it compounds.

2026 context: the pace of change

Two things have changed for a graduate weighing a change of direction. The first is that the skills employers ask for move faster: by spring 2026 the number of entry-level postings asking for skills in artificial intelligence had nearly doubled in a year (CNBC, 2026b), which rewards the habit of learning in public — a course, a side project, a visible repository — over waiting for an employer to train you. The second is that employers themselves move: the clean-tech and software layoffs in Chapter 4 mean that a direction can close while you are still deciding. Both make the case for cheap experiments now rather than a long deliberation later.

Capstone move

Take out the values and goals you wrote in Lecture 1, or write them now if you did not. Cross out anything that is no longer true, add anything that has become true, and design one experiment of no more than five working days to test the goal you are least sure of.

Discussion questions

1. Zelnick says "a slavish devotion to one's earlier goals is a bad idea" (p. 139). When is sticking to a goal persistence, and when is it slavish?
2. Which of Ravi's four options is a left turn, and which is going straight on?
3. Ibarra (2003) argues for acting before you are sure. What are the risks of that for a new engineer with little savings?
4. Is "what goes around, comes around" a moral claim or a practical one? Does it matter?

Assignment — Revised setpoint and two experiments (Renewal Plan, Part 1)

Task.

1. Revise your Personal Setpoint from Lecture 1: your values and goals, with a sentence on each change and why.
2. Identify two possible directions for your first five years after graduation that differ in a real way (not two similar employers).
3. Design and run one small experiment for each (five working days at most, and the two may run in parallel; a 30-minute conversation with someone in the field counts), as in Table 3.1, and record what it showed. Disclose no confidential information from an employer or placement.

Deliverable and due date. Two pages (PDF), due at the end of week 2. If someone does not reply in time, report what you did instead: a documented attempt and a substitute experiment earn full marks.

Marking (10 marks).

- *Revised setpoint* (3): values and goals revised, each change explained (3); revised without explanation (2); copied unchanged (1); missing (0).
- *Directions* (2): two genuinely different directions (2); two similar ones (1); missing (0).
- *Experiments* (5): two experiments run, each with a specific finding that changed or confirmed a view (5); two run, only one with a specific finding (4); two run, findings vague (3); one run (2); designed but not run (1); missing (0).

Chapter 4

What Happens When Your Job Ends

4.1 When, not whether

Zelnick's argument

"The title of this section includes the word 'when' — not 'whether.' One thing you need to know about any job is that it will, at some point, come to an end. You may decide to resign or to retire. You may also be fired. In any case, a job is not permanent" (p. 143).

"In my view a job should end when you've obtained the most you can out of it, and when it's received the most it can out of you" (p. 144). At Columbia Pictures he decided in advance to leave once he was promoted to vice president, because the company was slow to advance young executives (pp. 143–144). And he is blunt about the rest: "Turbulent and perhaps humiliating it may be, but it is important to anticipate this reality: losing your job happens. It *will* happen" (p. 144).

Zelnick tells of a former colleague, fired after more than ten successful years running a music label, who came to him "ashen". Zelnick reminded him of the Grammys, the artists, the money and the industry's habits: "Now why were you surprised — and why are you so devastated?" The man paused and said, "You're right. It's time to start the next chapter" (p. 145).

What the research says: job loss hurts, and some things help

- **The effect is real.** A meta-analysis of 104 studies found that unemployed people had lower mental and physical well-being than employed people, and that personal, social and financial coping resources and time structure were associated with better well-being during unemployment (McKee-Ryan et al., 2005).
- **Job search can be taught.** Across 47 job-search interventions, participants had 2.67 times the odds of finding employment of those in control groups. The interventions worked best when they combined building job-search skills with building motivation, such as self-efficacy, goal setting and social support (Liu et al., 2014).
- **Effort modestly predicts results.** Job-search behaviour had a modest positive relationship with finding employment, and was itself related to self-efficacy, social support and other personal factors (Kanfer et al., 2001).

The evidence supports both halves of Zelnick's advice: take the loss seriously, and treat the next search as a skill to be practised, not a verdict on your worth.

4.2 Before it happens

Zelnick's list of what makes losing a job easier begins well before the day itself (pp. 145–146):

Zelnick's argument

"Save money so that you're protected if you become unemployed." "[M]any people, including highly-compensated executives, live paycheck to paycheck. Don't be one of them."

"Plan ahead. Always have a current résumé. Make sure you know recruiters in your field and occasionally keep them updated on your career progress. Keep in mind what you want to do after your current job ends" (pp. 145–146).

Ravi did some of this and not the rest. Exhibit 2 shows about two and a half months of spending in savings. His résumé was last updated in 2025. He knew no recruiters. Figure 4.1 shows how far his cash goes and how much each choice he now faces moves the answer: signing the release takes him from 3.6 to 4.9 months, and exercising the options would take him from 4.9 back to 3.4. Table 4.1 turns Zelnick's list, with Morse, Schell & Babcock's advice on staying current, into things an engineer can check once a year.

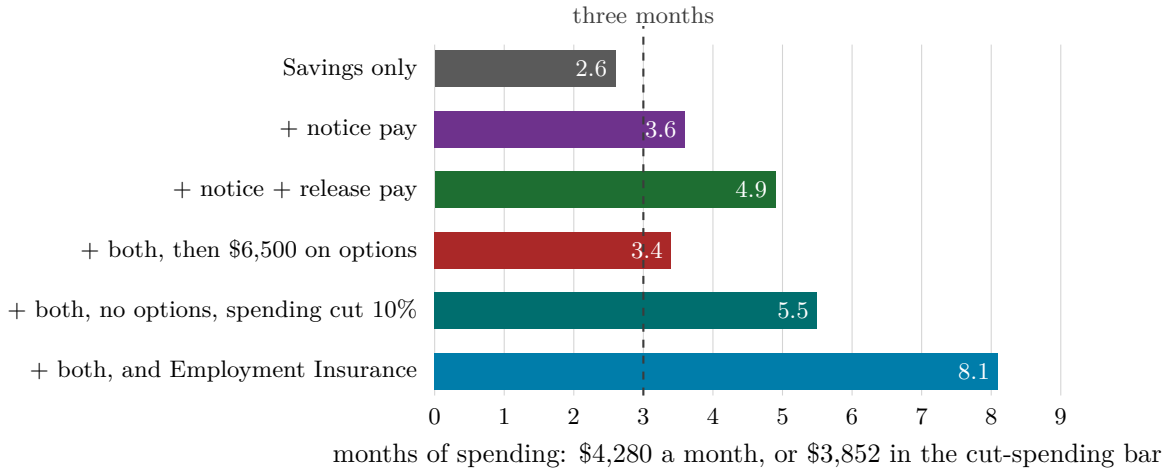


Figure 4.1: How many months Ravi's cash would cover his spending (Exhibit 2); the colours distinguish the scenarios and carry no other meaning. Notice and release pay are shown after an assumed 22% tax; exercising the options costs $6,500. The last bar assumes Employment Insurance is approved at the maximum, about $570 a week after tax, from mid-July, for an assumed 24 weeks. The bars are alternative choices, not a sequence, so they are not ordered by length, and the last one adds an income rather than a stock of cash; single choices move the answer by a month or more. The dashed line marks three months, the cushion Chapter 6 treats as the floor for a considered decision.

Table 4.1: Zelnick's preparations (pp. 145–146), plus Morse, Schell & Babcock's advice on staying current (pp. 373–375), as an annual check for an engineer, with Ravi's position on 16 May.

Preparation	Annual check	Ravi
Savings	At least three months of spending, kept separate	About 2.6 months
Current résumé	Updated with the year's projects, numbers and skills	Last updated 2025
Network	Five people outside your employer who know your work	Mostly Voltaris colleagues
Portfolio	Evidence you can show without breaching confidentiality	None prepared
Skills current	One course, certificate or new tool learned this year	Not recorded
Experience record	Engineering experience recorded and validated to date	Nothing validated since 2026
Next step	A sentence on what you would do if the job ended tomorrow	None

2026 context: layoffs in technology and clean-tech

Engineers in venture-funded companies are especially exposed to layoffs that have nothing to do with their own performance: when a funding round fails or investors change their minds about a sector, whole teams go at once. Quebec's electric bus maker Lion Electric entered creditor protection in December 2024 after major layoffs (CBC News, 2024), and the Swedish battery maker Northvolt filed for bankruptcy in March 2025 (Northvolt, 2025). In Ontario, Honda postponed its planned $15-billion electric-vehicle and battery investment by at least two years in 2025 (CBC News, 2025) and suspended it indefinitely in May 2026 (CBC News, 2026). Software is not immune: in October 2025 Amazon announced about 14,000 corporate job cuts while increasing its investment in artificial intelligence (CNBC, 2025), and about 16,000 more in January 2026 (CNBC, 2026a). That makes the preparations in Table 4.1 more important, not less, for graduates who choose start-ups. It also means that a layoff on a résumé is common, and is best explained plainly.

4.3 When the moment comes

Zelnick's argument

"Stay calm and negotiate the best exit package you can." "If you find yourself feeling emotional, leave the office until you regain your composure. In any case, do not burn bridges with your current employer or colleagues. This is not the time to tell people what you really think of them" (p. 146).

"Take the time you need to work through emotionally what happened" (p. 146). Otherwise "you are likely to come across in interviews as angry or embittered" (p. 147).

"Don't start looking for a new job unless and until you reflect on and can commit to, yes, that which you truly want next" (p. 147).

Figure 4.2 puts Ravi's deadlines on one line. Several of them arrive before he can know which

option he wants, which is why the first week matters so much.

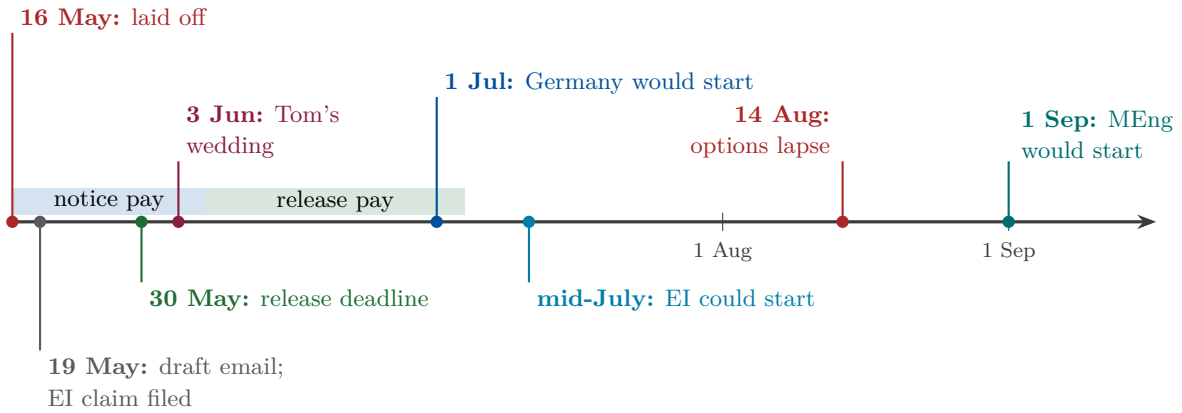


Figure 4.2: Ravi's deadlines after 16 May 2028 (Exhibits 1–4). The release deadline comes two weeks after the layoff and the option window closes after 90 days, so the cash decisions arrive before the career decision can be made. Employment Insurance normally starts only after the shaded separation-pay weeks — the release pay only if he signs — and a one-week waiting period. The bands show the weeks the separation pay covers.

Know your rights (Ontario)

Under Ontario's *Employment Standards Act*:

- **Notice.** After three months' continuous service, an employee is entitled to written notice of termination or pay in lieu. The minimum grows with service:

Period of employment	3 mo–1 y	1–3 y	**3–4 y**	4–5 y	5–6 y	6–7 y	7–8 y	8 y+
Weeks of notice	1	2	**3**	4	5	6	7	8

  Each band runs up to but not including its upper figure; Ravi's 3 years and 8 months falls in the bolded column. During the statutory notice period the employer must keep up its contributions to benefit plans, even when it pays in lieu of notice (Government of Ontario, n.d.b).

- **Mass termination.** If 50 or more employees are let go at one location within four weeks, longer notice (at least eight weeks) applies (Government of Ontario, n.d.b). Voltaris cut 44, just below that threshold, so the ordinary rules apply to Ravi.

- **Severance pay** is separate. It applies to employees with five or more years of service where the employer has a global payroll of at least $2.5 million, or ends the employment of 50 or more people in six months because it permanently closes all or part of its business, and is capped at 26 weeks (Government of Ontario, n.d.a). At 3 years and 8 months, Ravi does not qualify for it.

- **Employment Insurance.** Benefits are 55% of average insurable earnings up to the yearly maximum insurable earnings, which were $68,900 in 2026 — about $730 a week (Employment and Social Development Canada, 2025). How long they last depends on your insurable hours and the regional unemployment rate, and runs from 14 to 45 weeks. Pay in lieu of notice and severance are normally allocated to the weeks after the job ends, which delays the first payment (Employment and Social Development Canada,

n.d.). Temporary federal measures have at times relaxed this rule, so check the position when you apply.

- **Duty to mitigate.** This one is a common-law principle rather than part of the Act: if you claim more than the statutory minimum, you are generally expected to look for comparable work in the meantime; refusing reasonable offers can reduce what a court awards. That legal duty sits awkwardly with Zelnick's advice to wait until you know what you want (p. 147), and the practical answer is to do both at once.
- **Record of Employment.** Your employer files this electronically; Employment Insurance cannot process a claim without it, so check that it has been issued.
- **What the money is called matters.** Most separation payments, including a retiring allowance, are allocated and delay benefits; a few things are not, such as damages for a separate human-rights claim or reimbursed legal fees. Ask what each part of an offer is for before you sign (Employment and Social Development Canada, n.d.).
- **Get advice.** These are minimums. Unless a valid contract limits it, a court may award considerably more "reasonable notice". That is the real reason to ask a lawyer or your university's legal clinic before signing a release in exchange for an offer like the one in Exhibit 1. Rules differ in other provinces and countries.

Engineering translation: what a good ending looks like

For an engineer, a good ending has five parts, and all of them are easier if you start early: a handover note another engineer could act on; two named references who have seen your work; a portfolio of what you built that breaches no confidence; a two-sentence account of why the job ended; and, for anyone on the path to a licence, a validated experience record. Ontario's competency-based assessment asks for an account of your engineering experience, validated by the professional engineers who supervised it, so collect those validations while the people who supervised you are still reachable — the experience itself still counts toward the licence. Ravi can still produce all five in the week after 16 May — his colleagues are still reachable, and the work is fresh — which is why the order of his week matters more than the speed of his job search.

4.4 Leaving well

Engineering translation: what to ask for

Zelnick's "negotiate the best exit package you can" (p. 146) is not bravado; it is a short list of asks, made once, politely, before you sign anything. For an engineer the list usually is: more weeks of pay; benefits continued to the end of that period; a written reference or an agreed form of words about why the job ended; a longer window to exercise vested options, which otherwise closes in 90 days; and a later deadline on the release itself, so a lawyer or a legal clinic can read it. The worst outcome of asking is usually no.

Myth check: "There are no second acts"

Zelnick quotes F. Scott Fitzgerald's line, "There are no second acts in American lives", and answers it: "He was specifically wrong: American lives are chock-full of second, third, fourth and fifth acts" (p. 147). The evidence mostly agrees, with a caveat. Morse, Schell & Babcock note that career stages "may occur at widely varying ages" (Morse et al., 2020, p. 367). Graduates who start in a recession typically see their earnings losses fade over about a decade, though not evenly (Oreopoulos et al., 2012). Experienced workers displaced in mass layoffs fare worse: Jacobson et al. (1993), studying workers displaced in Pennsylvania in the 1980s, found that those with six or more years in the job were still earning around a quarter less years afterwards. The recession figures are averages, too: the least advantaged graduates recover most slowly. On balance, the risk is smaller for a young engineer with short service — a layoff at 26 is more likely to end a job than a career.

Capstone move

Update your résumé this week with your capstone project: what you built, your part in it, and one number that shows the result. Send it to one person outside the university who knows your field and ask for a single piece of advice.

Exhibit 5 is the note Ravi wrote on 22 May, and the model for Part 2 of your Renewal Plan.

Exhibit 5 — Ravi's handover note, 22 May 2028 (extract)

Battery management system, delivery van programme — state on 16 May 2028

- **What is done.** Cell-balancing firmware v2.4 is released and signed off (repository `bms-fw`, tag `v2.4.1`). State-of-charge estimator v3 passed the cold-chamber campaign: error 2.5% from −20 to +45°C, down from 6%. Test reports are in `/programme/van/validation/2028-04`.
- **What is open.** Contactor-weld detection fails intermittently on pack 7 (about one run in forty). My best guess is the shunt filter time constant, not the contactor; the trace is saved as `weld_2028-05-09.csv`. The supplier's firmware update, due in June, changes this interface.
- **What I would do next.** Repeat the pack 7 run with the filter at 5 ms and 20 ms before blaming the hardware; then close out the fault tree, which is complete except for the weld-detection branch.
- **Who knows what.** Priya Raman, P.Eng., ran the cold-chamber tests; Daniel Okoye owns the charger interface. The supplier contact is in the programme address book.
- **Access.** Repositories transferred to Priya on 19 May; bench keys returned.
- **Experience record.** Priya, as the supervising P.Eng., has validated my experience to 16 May.

Discussion questions

1. Zelnick told his fired colleague he had no reason to be "so devastated" (p. 145). Is that kind, or harsh? Would it work for Ravi?

2. Should Ravi sign the release for four more weeks' pay? What would you want to check first?

3. Zelnick says not to start looking until you know what you want next (p. 147). Can Ravi, with three and a half to five months of cash before Employment Insurance, and five and a half only if he also cuts his spending (Figure 4.1), afford that advice?

4. Is it ever right to tell a former employer what you really think? How, and when?

Assignment — Ending plan (Renewal Plan, Part 2)

Task.

1. Complete Table 4.1 for yourself, as of today, with one action for each row, and mark on a timeline like Figure 4.2 the deadlines that would matter to you.

2. Write the handover note you would leave if your current job, co-op or capstone role ended tomorrow (one page), using Exhibit 5 as a model.

3. Write the two-sentence explanation of a layoff or a failed project you would give in an interview: factual, without bitterness, and pointing forward.

Deliverable and due date. Three pages (PDF), due at the end of week 3. Figures for savings and dates on the timeline may be invented.

Marking (15 marks).

- *Preparation table* (3): all seven rows, each with a specific action and date (3); one or two rows vague (2); three or more vague (1); missing (0).
- *Timeline* (2): dated, with the deadlines that would apply to you (2); undated or generic (1); missing (0).
- *Handover note* (6): current state, file locations, open issues and recommended next steps, clear enough for a stranger (6); all four present but unclear in places, or one missing (5); two missing (4); three missing (3); only a list of files (2); a few unstructured sentences (1); missing (0).
- *Interview explanation* (4): factual, calm and forward-looking (4); one of these weak (3); two weak (2); bitter or evasive (1); missing (0).

Chapter 5

A Whole Life

5.1 The personal advice

Zelnick ends his book with advice that is not about business at all. "[H]appiness often has little, if anything, to do with our career success or material wealth. Even so, many of this book's principles can properly be applied to, and may well improve and enhance, one's personal life" (p. 148). He gives eleven short rules. Table 5.1 takes the six that bear most directly on a career setback, sets out the evidence that supports or limits each, and says what each would mean for Ravi this month. The six are the ones with something at stake after a layoff: they cost time rather than money, they are the first things to go when work fills the week (Table 5.2), and each has a body of evidence that either supports it or sets a limit on it. The five left aside — offer courtesy, don't talk behind others' backs, don't raise your voice, less is more, and grooming — are about everyday conduct, and Lectures 4 and 5 covered that ground.

Table 5.1: Six of Zelnick's eleven personal rules (pp. 148–161), using his headings, with the evidence that supports or limits each and what each suggests for Ravi. The other five, named in the text above, concern everyday conduct.

Rule	Evidence (supports or limits)	For Ravi
Just show up	Supports, indirectly: social support was associated with better well-being during unemployment (McKee-Ryan et al., 2005), and strong social relationships with better survival over the long run (Holt-Lunstad et al., 2010); neither study tests turning up on the day	Go to Tom's wedding
Try to help others when you can	Supports: volunteer work is associated with higher well-being, though happier people also volunteer more (Thoits and Hewitt, 2001)	Offer references for laid-off colleagues
Fitness matters	Supports: regular activity lowers the risk of chronic disease and early death (Warburton et al., 2006) and reduces symptoms of depression (Singh et al., 2023)	Back to the gym, on a schedule
Be grateful	Supports, weakly: gratitude exercises raise well-being (Emmons and McCullough, 2003), but effects are small against fair comparisons (Davis et al., 2016)	List three each week: three years of learning; a network; his health
Wanting what you have	Limits: emotional well-being keeps rising with income for most people; it levels off above about $100,000 only for the least happy (Killingsworth et al., 2023)	Take the pay seriously, and still judge Gridline by the work
Authenticity	Supports: feeling authentic is associated with higher well-being and engagement, though the evidence is correlational (Sutton, 2020); see Section 5.4	Choose by his card, not by what looks impressive

5.2 Show up, and help

Zelnick's argument

When a college roommate's father died, Zelnick flew to the funeral and found he was "the only one of Bill's friends to attend"; the friends who came to every party had stayed away. "That experience made me realize that it's easy to do the fun things in life. Certain things, though, aren't fun or easy to do, like visiting someone when they're sick. … Part of being a friend, or a family member, or a decent person is just showing up. Wendy and I make a point of it, even if it's inconvenient, even if we're tired, and even if we *really* don't want to go" (p. 149).

"Helping others should be a reward in its own right. … At the same time, I've received an unexpected collateral benefit from the connections I've made that began with a casual meeting in which I offered an ear and some advice. Remember: what goes around, comes around applies to good energy as well as bad" (p. 155).

Ravi does not want to go to Tom's wedding because he does not want to explain the layoff (Exhibit 4). Zelnick's rule is designed for exactly that feeling. The wedding is also, quietly, the best job-search event Ravi has this month: a room full of people who like him, many of them engineers.

What the research says: social ties and health

A meta-analysis of 148 studies and more than 300,000 participants found that people with stronger social relationships had about 50% greater odds of survival over the follow-up periods studied (odds ratio 1.50) (Holt-Lunstad et al., 2010). The authors judged the association to be comparable to well-established risk factors for mortality. After a job loss, when the working day no longer supplies company, the contacts people keep up on purpose matter more.

5.3 Fitness, gratitude and enough

Zelnick's argument

Fitness. When he wrote his first list of values and goals at BMG, Zelnick "realized that health and fitness were a real priority". He scheduled daily exercise and treated it "as I would a business meeting or personal commitment" (p. 156). "Make it a priority for just three months and see what happens. You'll look and feel better, and you'll also perform better at work. That's a promise" (p. 157).

Gratitude. "Most days, even the rough ones, I take time to be grateful for all of my good fortune. And that alone makes life sweeter" (p. 159).

Wanting what you have. "The subtitle of this book is 'A Concise Guide to Having the Life You Want.' At some point, though, you also need to want the life you have" (p. 159). When a much larger house "became available on stunningly attractive terms", he thought about it seriously, then realised: "I'm happy in this house. … A bigger or more impressive house not only won't make me any happier — I don't want it. In this instance, I want

what I have" (p. 160).

What Morse, Schell & Babcock add: long hours are not the answer

Morse, Schell & Babcock quote Amos and Sarchet's warning to engineers moving into management, which applies equally to a new engineer running a subsystem: "When the engineer puts in long hours at [their] office, does not take regular vacations, and spends little time with [their] family, [they] also [fail] to have time to develop the creative aspects of engineering management that are important to [their] success." Their remedy is priorities, not hours: "The solution is not working long hours. Instead, it is setting priorities" (Morse et al., 2020, p. 386). Ravi's sixty-hour weeks (Exhibit 4) are the pattern they describe; Table 5.2 shows what a week with priorities set might look like.

Table 5.2: Ravi's 168-hour week in spring 2028 (Exhibit 4: sixty-hour weeks, no gym, sleeping at 3 a.m.) and one plan for the weeks after 22 May, in hours. The figures are illustrative: exercise is three 90-minute gym mornings including travel, and "everything else" is meals, travel, chores and rest. The two rows that matter most are the smallest.

Part of the week	Spring 2028	Plan, from 22 May	Change
Work, or the job search that replaces it	60	40	−20
Sleep	42	52.5	+10.5
Exercise	**0**	**4.5**	**+4.5**
Friends and family	**2**	**8**	**+6**
Everything else	64	63	−1
Total	168	168	—

What the research says: exercise, gratitude and choice

- **Exercise.** A review of the evidence concluded that regular physical activity reduces the risk of many chronic diseases and of premature death (Warburton et al., 2006). An overview of 97 systematic reviews found that physical activity reduced symptoms of depression and anxiety, with moderate effects on both (Singh et al., 2023) — relevant to someone sleeping at 3 a.m. after a layoff. Zelnick's practical method — scheduling exercise like a meeting — is exactly what makes the habit stick.
- **Gratitude.** Participants who kept a weekly list of things they were grateful for reported higher well-being on several, though not all, measures than those who listed hassles or neutral events (Emmons and McCullough, 2003). A later meta-analysis found that the benefit of gratitude exercises shrank as the comparison got fairer, and was close to nothing against another positive activity (Davis et al., 2016): worth doing, but not a cure.
- **Choosing "good enough".** People who habitually try to find the best possible option ("maximizers") reported less happiness and more regret than those who settle for a good

option ("satisficers") (Schwartz et al., 2002). The evidence is correlational, but it fits Zelnick's house.

Myth check: "Money stops making people happier above a fixed income"

A widely quoted finding is that day-to-day emotional well-being stops rising above an income of about $75,000 a year (Kahneman and Deaton, 2010). Later work suggests the picture is more varied: for most people, emotional well-being keeps rising with income, and the flattening appears only among the least happy (Killingsworth et al., 2023). Zelnick makes the point that matters for a career: happiness is "largely uncorrelated with wealth or career success, especially after one achieves a basic level of comfort" (pp. 159–160). The research adds detail about income, and supports his lesson: more is not automatically better, and wanting what you have is a choice.

5.4 Be yourself

Zelnick's argument

"And perhaps this is the key to it all: be yourself" (p. 161). Of his younger self he writes: "As a result I often came across as tough, cold, self-centered and unapproachable. The truth is that I'm none of these things (or at least I think I'm none of these things)." "In the past decade, coincident with building my own business, I've taken pains to be, more and more, authentically myself." "I've found, and continue to find, that as I am willing to risk actually being myself in all situations, I'm more comfortable, more approachable, more persuasive, more successful, much funnier — and vastly happier. I wish that for you" (p. 161).

The engineering version of this is not a personality: it is consistency. The engineer whose estimates mean the same thing in a status meeting as in a design review, who says "I don't know" in both, is easier to work with and easier to promote. Zelnick's argument is that the effort of maintaining two versions of yourself is wasted effort, and the evidence points the same way (Sutton, 2020) — though that evidence is correlational and rests on people's own reports of how authentic they feel, so read it as support for the habit, not proof that it causes the result.

Engineering translation

For an engineer choosing a next step, being yourself has a concrete test: would you still choose this option if nobody else would ever know which one you chose? Gridline may look like a step back to former colleagues; the MEng may look impressive on LinkedIn; the start-up may sound exciting at the wedding. Ravi's card (Exhibit 4) is the better guide, because he wrote it for himself.

Capstone move

Before the end of term, put three things in your calendar as if they were meetings: three exercise sessions a week (thirty minutes is enough to start; Ravi's plan in Table 5.2 allows ninety, including travel), one visit or call you have been putting off, and fifteen minutes on Friday to write down three things that went well.

Figure 5.1 shows how the three parts you have written fit together into one document.

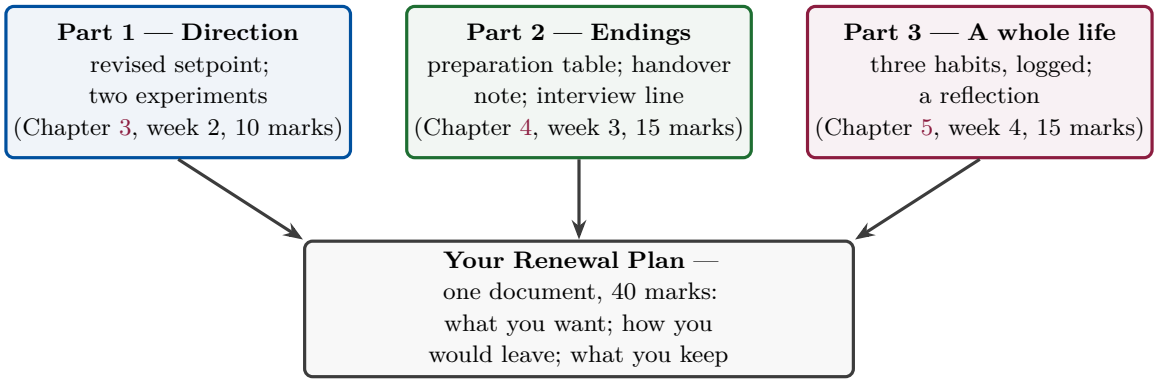


Figure 5.1: The three chapter assignments are one document: a direction, a way of leaving well, and the parts of a life that survive both.

Discussion questions

1. Which of Zelnick's personal rules is hardest for engineering students, and why?
2. Zelnick writes from a long career leading large companies. Which of his rules need savings behind them, and which apply from your first job?
3. Is "want what you have" at odds with ambition, the subject of Lecture 2?
4. How would you tell whether a career choice is "being yourself" or just avoiding something hard?

Assignment — Whole-life plan (Renewal Plan, Part 3)

Task.

1. Choose three of Zelnick's personal rules. For each, set one specific habit and schedule it for three weeks, starting on the day of this lecture, as Zelnick schedules exercise. The fourth week is for the reflection.
2. Keep a brief weekly log: did you do it, what got in the way, what you noticed.
3. Write a one-page reflection: which habit you will keep, which you will drop, and how your revised setpoint (Part 1) and ending plan (Part 2) fit together.
4. Write a one-paragraph introduction to your *Renewal Plan* linking Parts 1–3.

Deliverable and due date. Three pages (PDF), due at the end of week 4. You choose what to share; the log may be summarised rather than detailed.

Marking (15 marks).

- *Habits* (4): three specific, scheduled habits (4); two (3); one (2); vague intentions (1); missing (0).
- *Log* (4): three weeks recorded as they happened, with obstacles noted (4); two weeks (3); one week (2); fragments, or a log written up afterwards (1); missing (0).
- *Reflection* (6): honest about what did not work, connected to Parts 1–2, with a decision (6); one of these weak (5); two weak (4); all three weak but specific (3); generic (2); a sentence or two (1); missing (0).
- *Introduction* (1): links Parts 1–3 (1); missing (0).

Chapter 6

The Case Revisited

A good case has no answer key, only better and worse *reasoning*. This chapter does not tell Ravi what to choose; it shows what the exhibits reveal and one defensible plan.

6.1 What the exhibits show

- **Exhibit 1 is a layoff, not a verdict.** Voltaris failed to raise money and cut 40% of its staff, including the whole battery team. The notice pay is the legal minimum; the extra four weeks are a negotiation (Chapter 4).
- **Exhibit 2 shows Zelnick's first preparation too thin.** About two and a half months of spending in savings, and a full month more once the notice pay lands. Exercising the options would spend more than half of his savings on a stake in a company that has just failed to raise money (Lecture 8).
- **Exhibit 3 offers four real choices, not one right one.** Each can be tested in days (Table 3.1) against the values on Ravi's card (Chapter 3).
- **Exhibit 4 shows a life that narrowed.** No gym since March, sleeping at 3 a.m., a wedding he wants to skip. Zelnick's personal advice is aimed at exactly this (Chapter 5).

How to weigh the options is Ravi's call, but the method is clear: run the experiments, then score each option against the values and goals on his card and against the cash plan (Table 6.1). An option that fits the values and keeps him above three months of cash (Figure 4.1) deserves more weight than one that pays more and fits one value.

6.2 One defensible first step

The most important decision of the week is the one Ravi faces at 11:40 on Friday night:

> **Do not send the email. Save it, sleep, and read it again in a week — then delete it.**

Zelnick is explicit: "This is not the time to tell people what you really think of them" (p. 146). The email would cost Ravi references, goodwill and, in a small industry, possibly a future job; it would change nothing at Voltaris.

6.3 Scoring the options

Table 6.1 is the grid the method above produces, filled in with what Ravi knows on 19 May. It is not an answer: the experiments in Table 3.1 are what turn the question marks into marks, and how he weighs them is his to decide.

Table 6.1: Ravi's options (Exhibit 3) against the values and goals on his card (Exhibit 4) and against the cash plan, as he knows them on 19 May. ✓ fits, ∼ partly fits, × does not fit, ? needs an experiment; partial fits and question marks both count as *not yet met* in Figure 6.1. The question marks against Gridline are there because the interview has not happened; Kwame's ticks rest on what Ravi already knows of the work rather than on a test, which is its own kind of uncertainty. His third goal, running a marathon, is not in the grid: it depends on how he spends his week (Table 5.2), not on which employer he chooses.

Option	For the climate	Close to family	Live in Canada	Keep learning	Lead a team	Effect on cash
A. Gridline	✓	✓	✓	?	?	Ends the problem in about six weeks
B. MEng	∼	✓	✓	✓	×	Spends savings and adds tuition; no full-time pay until 2029
C. Kwame	✓	✓	✓	✓	✓	No salary for six months: below three months of cash by August
D. Germany	✓	×	×	✓	∼	Strong for nine months, then uncertain

Figure 6.1 plots the same four options on the two axes that decide the question: how well each fits the card, and how long each leaves him without pay.

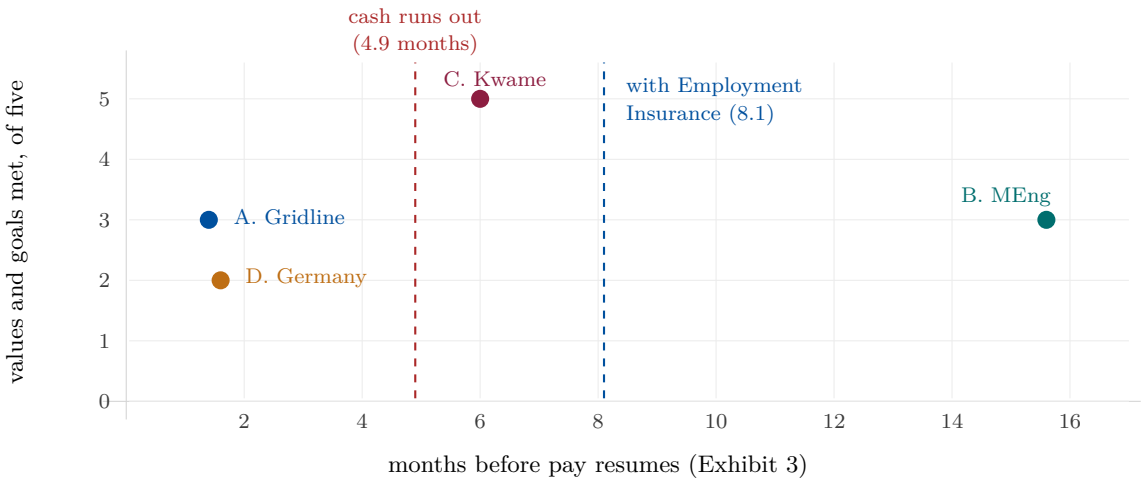


Figure 6.1: The four options on the two axes that decide the question: how many of the five values and goals in Table 6.1 each option clearly meets today (partial fits and question marks count as not met, which is what the experiments in Table 3.1 are for), and how long each leaves Ravi without full pay, from Exhibit 3: Gridline and Germany both within about six weeks, Kwame after six months, and the MEng only when it ends in 2029 (a part-time teaching assistantship aside). The dashed lines are the 4.9 months of cash he has if he signs the release, and the 8.1 months if Employment Insurance is approved (Figure 4.1). Anything to the right of them needs another source of money.

6.4 A worked plan

Table 6.2 sets out one plan for the next few weeks.

Table 6.2: One plan for Ravi's next few weeks.

When	Action	See
Fri 19 May	Save the email as a draft. Go to sleep.	Ch. 4
Mon 22 May	Build a month-by-month cash plan including Employment Insurance (Figures 4.1 and 4.2); cut spending where he can	Ch. 4
22–26 May	Ask a legal clinic to look at the release before 30 May; ask for references from two colleagues; send handover notes to his manager	Ch. 4
22–26 May	Interview at Gridline; ask to see the roadmap and meet the team lead. Book a three-day trial with Kwame. Call the German team	Ch. 3
From 22 May	Gym three mornings a week, scheduled; a fixed bedtime (Table 5.2)	Ch. 5
Sat 3 Jun	Go to Tom's wedding; say plainly that Voltaris laid off its battery team and he is choosing what comes next	Ch. 5
By 9 Jun	Decide, using his card and the experiments, not the salary alone	Ch. 3
By 14 Aug	Decide on the vested options before the 90-day window closes; exercise only if the cash plan allows it (Figure 4.2)	Ch. 4

Closing the series

This is the last lecture in the series. It began with Zelnick's first instruction — write down what you want — and it ends with his last: be yourself. In between, the lectures have argued that

the habits that make a good engineer's career are learnable: setting priorities, starting well, listening and persuading, working with difficult people, telling the truth, leading, understanding the business, and renewing all of it when the plan breaks. Keep your list. Revise it once a year.

Table 6.3 is one answer to the question the last five minutes of the class asks: what will you keep?

Table 6.3: One keepable habit from each lecture in the series. None takes more than an hour a month; together they are most of what the nine lectures argue for.

No.	Lecture	The habit worth keeping
1	Knowing What You Want	Keep a written list of values and goals; revise it once a year
2	Ambition, Priorities and the Long Game	Decide each week what you will *not* do
3	The First 1,000 Days	In a new role, write down what "good" looks like in 90 days and ask whether you have it right
4	Listen, Sell, Speak	Before proposing a design, write the one sentence your audience cares about
5	People, Politics and Resilience	Separate the problem from the person, in writing, before responding
6	Integrity, Truth and Mistakes	Report bad news early, with the data and a proposed next step
7	From Engineer to Leader	Delegate one task a month that you could do faster yourself
8	The Business Behind the Engineering	Know how your employer makes money and what its cash position is
9	Renewal	Run the annual check in Table 4.1, and schedule what matters as if it were a meeting

The one-sentence version of this lecture. Every job ends and every plan changes, so keep your values current, test new directions with small experiments, leave well when the end comes, and look after the parts of your life — friends, health, gratitude — that no employer can give or take away.

Glossary

Allocation (Employment Insurance) The rule that treats pay in lieu of notice and severance as earnings for the weeks after a job ends, which delays benefits (Employment and Social Development Canada, n.d.).

Cap table The record of who owns what share of a company, and on what terms.

Career experiment A small, low-cost trial of a possible direction, used to learn before committing (Ibarra, 2003).

Common-law reasonable notice The notice (or pay in lieu) a court may award on dismissal, often more than the statutory minimum (see *Termination notice*), unless a valid contract limits it.

Creditor protection (CCAA) A court process under Canada's *Companies' Creditors Arrangement Act* that lets an insolvent company pause claims while it restructures.

Duty to mitigate The expectation that a dismissed employee claiming more than the statutory minimum looks for comparable work in the meantime.

Employment Insurance Canada's federal programme of temporary income support for eligible people who lose their jobs.

Exercise (an option) To buy the shares an option entitles you to, at the strike price.

Experience record The account of your engineering experience that a provincial regulator requires for licensure, validated by the professional engineers who supervised it. Ontario's separate Engineering Intern (EIT) designation has been closed to new applicants since 2023.

Handover note A short document recording the state of your work so that someone else can continue it.

Job-search intervention A structured programme to help unemployed people find work (Liu et al., 2014).

Left turn Zelnick's term for a deliberate change of career direction (p. 139).

Mass termination In Ontario, the termination of 50 or more employees at one establishment within four weeks, which requires longer notice (Government of Ontario, n.d.b).

Maximizer and satisficer Someone who seeks the best possible option, versus someone who accepts a good enough one (Schwartz et al., 2002).

Maximum insurable earnings The yearly earnings ceiling used to calculate Employment Insurance premiums and benefits (Employment and Social Development Canada, 2025).

Obsolescence Falling behind the knowledge and methods one's profession considers important (Morse et al., 2020, p. 374).

Pay in lieu of notice Wages paid instead of working through the notice period.

Personal Setpoint The list of values and goals written in Lecture 1, based on Zelnick's opening exercise.

Provisional self A trial version of a working identity, tested through small experiments rather than settled by reflection alone (Ibarra, 1999).

Record of Employment The form an employer files electronically recording why and when employment ended; Employment Insurance claims depend on it.

Release An agreement by a departing employee not to bring legal claims, usually in exchange for payment beyond the legal minimum.

Renewal Plan The three-part assignment of this lecture: a revised setpoint and experiments, an ending plan, and a whole-life plan.

Retiring allowance A payment made on or after leaving a job in recognition of service; like severance, it is normally allocated for Employment Insurance (Employment and Social Development Canada, n.d.).

Runway How long the money lasts at the current rate of spending.

Severance pay In Ontario, a separate payment for employees with five or more years of service in qualifying cases (Government of Ontario, n.d.a).

Strike price The fixed price at which a stock option can be exercised.

Termination notice Advance written notice of the end of employment required by statute (Government of Ontario, n.d.b); compare *Common-law reasonable notice*.

Vested options Stock options that have become the employee's to exercise.

Weak tie An acquaintance outside your close circle (Granovetter, 1973).

Instructor Notes

Purpose and timing

This 80-minute session closes the series and follows Lecture 8. Its job is to normalise change of direction and job loss, give students practical preparations, and end with the personal side of a career. Some students will have family members who have lost jobs, or be dealing with setbacks of their own; keep the discussion on the case unless students choose otherwise, and know your institution's student support services. Materials: printed copies of Exhibits 1–5, and the students' Personal Setpoints from Lecture 1.

Session plan

Minutes	Segment	Instructor moves
0–10	Open the case	Read Ravi's situation aloud. Vote: send the email? Which option?
10–30	Left turns	Students take out their Lecture 1 setpoints and revise one line. Build Table 3.1 for one student's dilemma using the loop in Figure 3.1. Cover the Ibarra myth check.
30–50	Endings	Walk through Figures 4.1 and 4.2, then Table 4.1 and the Ontario rules. Role-play the two-sentence interview explanation of a layoff.
50–65	A whole life	Discuss Table 5.1; students schedule one habit in their calendars in class.
65–80	Close	Debrief Chapter 6 (8 minutes); re-vote (3 minutes); close the series by asking each student for one habit from the nine lectures they will keep (4 minutes).

Talking points for every discussion question

Case (Chapter 2)

Q1: no; it costs references and goodwill and gains nothing. Q2: about 2.6 months on savings; roughly 3.6 with the notice pay after tax and about 4.9 with the extra four weeks (Figure 4.1); Employment Insurance and exercising the options change it. Ravi's own "six months at most" is a deliberate trap: it adds the pay before tax (($11,000 + $5,540 + $7,380) / $4,280 ≈ 5.6). Q3: on what Ravi knows on 19 May (Table 6.1), Gridline fits "for the climate", "close to family" and "live in Canada", and whether it teaches him anything is what the interview is for; on the card alone Kwame's start-up fits every line, which is why the cash column matters (Figure 6.1); Germany offers learning but fits "close to family" and "live in Canada" worst. Q4: yes. Q5: mainly neglecting savings, network and health; the layoff itself was not his doing.

Chapter 3

Q1: persistence when the goal still reflects your values; slavish when it no longer does. Q2: C and B are left turns; A continues the path; D is a detour. Q3: running out of money while

experimenting; keep experiments small. Q4: both; it works partly because reputations travel.

Chapter 4

Q1: harsh but useful for someone whose career is secure; Ravi needs the reframing more gently. Q2: only after a legal check: common-law notice could be worth more than the extra four weeks the release asks him to give up. Q3: partly; with three and a half to five months of cash, or five and a half if he cuts spending, he can reflect for a week or two while running experiments, not for months. Q4: rarely; in an exit interview, calmly and about specifics.

Chapter 5

Q1: often fitness or showing up, because workloads crowd them out. Q2: gratitude, showing up and helping cost little; a bigger house is a choice only the well-off face. Q3: no — ambition sets direction; wanting what you have stops the goalposts moving forever. Q4: the "nobody would know" test in the Engineering translation box.

Marking guidance

The parts are due at the ends of weeks 2, 3 and 4. A strong Part 1 runs real experiments rather than describing them. A strong Part 2 could be handed to a stranger. A strong Part 3 is honest about the habit that failed. The three parts total 40 marks. Do not require students to disclose real finances or health information.

Carrying Zelnick's advice into engineering

Zelnick wrote the book in the conversational style of his mentoring sessions (p. 13), and his advice is meant to be applied rather than parsed. The points below are places where an engineering setting, or the research, adds something to that advice. Use them to show students how to apply it well, not as reasons to discount it.

1. On happiness and wealth (pp. 159–160), later research adds detail about income and well-being (Killingsworth et al., 2023); his point about wanting what you have is the lesson.
2. "You'll also perform better at work. That's a promise" (p. 157) is a practitioner's promise; the health evidence (Warburton et al., 2006) supports the habit he recommends.
3. His advice to know what you want before looking (p. 147) is easiest with savings; with little cash, reflection and searching can run side by side.
4. "What goes around, comes around" (p. 141) is both a moral principle and a practical one; the research on weak ties (Rajkumar et al., 2022) supports its practical side.

None undermines his argument, and spotting them models the habit of checking sources.

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Conclusion

Closing the Loop

What the series adds up to, and the Northline case revisited

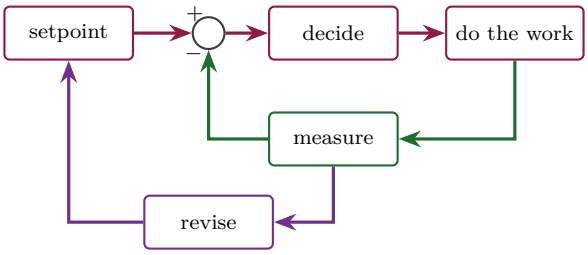
Audience: Senior capstone students in computer, electrical, mechatronics, mechanical and software engineering

Base texts: Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)

Morse, Schell & Babcock, *Managing Engineering and Technology*, 7th ed. (2020)

Case study: The Northline Programme, revisited (remote-microgrid energy storage)

Year: 2026



the loop, closed twice: this week, and this year

Puranjan Gaur
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Credits

Lecture design, case and figures	D! — Puranjan Gaur, pgaur@uottawa.ca
Narrative framework	Strauss Zelnick, *Success: A Concise Guide to Having the Life You Want*, 2nd ed. (2015)
Engineering-management content	Lucy C. Morse, William J. Schell IV and Daniel L. Babcock, *Managing Engineering and Technology*, 7th ed. (Pearson, 2020)
Research base	Peer-reviewed studies and reports listed in the References, each cited where it is used.

Feedback

Something unclear, wrong or missing? Tell me — it takes one click. Every page of the lecture body carries a small envelope, ✉, beside the page number. Click it and your mail program opens a message addressed to the author, with the page number already written in. If the envelope does nothing (some PDF readers block links), write to pgaur@uottawa.ca and quote the page number.

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Chapter 1

About This Document

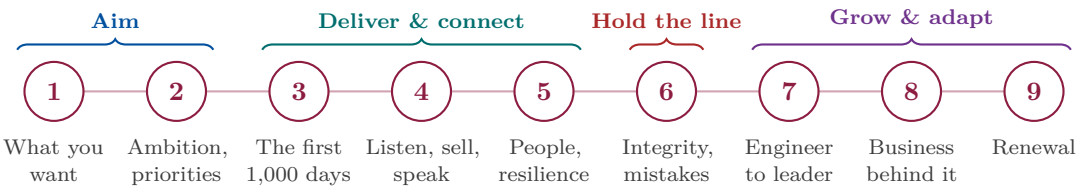


Figure 1.1: The nine mini-lectures, completed, in the four groups this review uses: Aim (1–2), Deliver and connect (3–5), Hold the line (6), and Grow and adapt (7–9). The introduction was the map; this document closes the loop on it.

Nine lectures ago the introduction made a claim: that an engineering career behaves like a closed-loop system, and that most of what goes wrong in one can be traced to a particular block of that system — a setpoint nobody wrote down, a sensor nobody reads, a delay nobody allowed for, an interlock treated as a preference. The lectures then took the blocks one at a time, with Strauss Zelnick's book as the narrative, Morse, Schell & Babcock as the engineering-management layer, and the research as the check on both.

This document does three things. It reviews what the nine lectures established, in a form you can keep. It puts the control system back together — the same chart as the introduction — and says what to *do* with it, week by week and year by year. And it returns to the Northline case, retold decision by decision, to show how the ideas of the whole series bear on it, and to ask you the questions that the case, and your own career, will ask of you: what can I choose here, and what happens next, and after that, and after that?

Learning objectives

By the end of this conclusion you will be able to:

- **Summarise** the nine lectures as one argument, stating for each the instruction, the evidence that supports or limits it, and the tool you keep.
- **Use** the Engineer's Roadmap as an operating routine, not just a picture: what to check weekly, quarterly and annually, and what never to trade.
- **Work** a real decision with the series' method: name the blocks involved, widen the option set, trace first-, second- and third-order effects, and check for an interlock.
- **Choose and defend** your own option at any of the eight Northline decision points, and say what evidence would change your mind.
- **Revise** the Personal Setpoint you drafted before Lecture 1, and apply the method to one decision of your own.

1.1 Sources, and what this document adds

The three sources are the ones the series has used throughout. Zelnick's *Success* (Zelnick, 2015) supplies the argument: a practitioner's account, written by someone who has spent four decades making the kinds of decisions the lectures describe, and who reports his setbacks alongside his successes. Morse, Schell & Babcock's *Managing Engineering and Technology* (Morse et al., 2020) supplies the engineering-management frame. Peer-reviewed research supplies the calibration: where a claim can be tested, the lectures tested it, and this review keeps the results.

Because this document is about decisions whose effects arrive over time, it adds four studies new to the series, which the individual lectures did not need. Together they make four points: that purposeful action reliably has consequences nobody intended (Merton, 1936); that people managing systems with delays systematically misjudge them (Sterman, 1989); that decisions made with more than one option on the table succeed more often (Nutt, 1999); and that judging a decision by how it turned out is a bias, not a method (Baron and Hershey, 1988). Together they are the evidence behind the question this document keeps asking — *and then what?*

Reading plan for the rest of this document (about 75 minutes)

Chapter 2 (15 minutes) is the review; keep Table 2.1 as a one-page summary of the series. Chapter 3 (15 minutes) is the roadmap and the routine that goes with it. Chapter 4 (10 minutes) retells the Northline case as eight decisions. Chapter 5 (25 minutes) works through them; it is the part to read with a pen. Chapter 6 (10 minutes) is the open questions and the final assignment.

Chapter 2

The Series in Review

Zelnick's book is written as a sequence of instructions: know what you want, set priorities, start well, listen, don't take the impersonal personally, tell the truth, lead, understand the business, be willing to turn left, and look after the rest of your life. Its strength is that each instruction comes from somewhere — a named colleague, a deal, a mistake he made and remembers — and that the instructions are meant to be put to use. The series kept his order and asked two further questions of each instruction: what does the evidence say about it, and what does it look like in an engineer's working week? Table 2.1 is the answer in one page.

The nine rows fall into the four groups marked on Figure 1.1: deciding what to aim at, delivering and being heard, holding the line, and growing and adapting. The sections below take the groups in turn, keeping only what you will need in Chapter 5.

2.1 Aim: what you want, and what comes first

The series began where the book does, with a definition. "I define success differently than many people. I define it as having the life you want" (p. 23), which requires two things: "first, knowing what you want; and second, getting it, or most of it, most of the time" (p. 23). Everything else in the series depends on the first of those. In control terms it is the setpoint, and a loop without one does not rest; it drifts toward whatever is loudest.

Zelnick's argument: the instruction that starts the loop

"It may seem simplistic, but writing things down helps in any number of ways" (p. 26). And, on the list that results: "Draw a four-square box with the X axis labeled 'Difficulty' and the Y axis labeled 'Impact' " (p. 39) — start with the easy, high-impact goals, and "as for the ones that are hard to achieve and have a low impact, don't bother" (p. 40).

The evidence the lectures gathered was largely supportive. Specific, difficult goals outperformed vague ones across hundreds of studies (Locke and Latham, 2002), and a meta-analysis of 138 studies found that simply monitoring progress toward a goal improved the chance of reaching it, more so when the progress was recorded or reported to someone else (Harkin et al., 2016). Lecture 2 added two cautions that matter for the rest of this document. First, people reliably underestimate how long their plans will take — honours students expected to finish their theses in about 34 days and took about 56 (Buehler et al., 1994). Second, the long game Zelnick describes, "Nothing worth having is easy to obtain" (p. 56), is better served by kill criteria — a stopping rule written in advance, which his own advice to drop hard, low-impact goals already points toward (p. 40) — than by grit alone, whose measured effect on performance is modest (Credé et al., 2017).

Table 2.1: The series on one page: Zelnick's instruction, what the evidence added, and the tool each lecture leaves you with

Lecture	Zelnick's instruction	What the evidence added	The tool you keep
1 Knowing What You Want	Define success as "having the life you want" and write your values and goals down (pp. 23–26)	Specific goals outperform vague ones; monitoring progress is itself an intervention (Harkin et al., 2016; Locke and Latham, 2002)	A written Personal Setpoint, reviewed weekly
2 Ambition, Priorities and the Long Game	Say what you want; rank goals by impact and difficulty; expect it to take years (pp. 34–40, 56)	People underestimate how long things take (Buehler et al., 1994); perseverance helps, modestly (Credé et al., 2017)	The impact–difficulty grid and kill criteria written in advance
3 The First 1,000 Days	Behave as the leader you hope to become; be early, responsive and visible (pp. 47–51, 85)	Role clarity, confidence and acceptance predict a good start (Bauer et al., 2007); very long hours buy little (Pencavel, 2015)	A 90-day definition of "good", agreed with your manager
4 Listen, Sell, Speak	Listen first; everyone sells; learn to speak (pp. 49–50, 124–131)	Being listened to builds trust (Kluger and Itzchakov, 2022); claim-first slides are understood better (Garner and Alley, 2013)	The decision in the first sentence
5 People, Politics and Resilience	Don't take the impersonal personally; aim to be respected rather than liked (pp. 72–73, 82)	Perceived politics is a measurable strain (Chang et al., 2009); forgiveness depends on the situation (Fehr et al., 2010)	Separate what happened from the story
6 Integrity, Truth and Mistakes	Never compromise your integrity; own mistakes, fix them, learn (pp. 52, 61)	Small lapses make larger ones easier (Welsh et al., 2015); people stay silent to avoid looking bad (Milliken et al., 2003)	A line drawn before the pressure arrives
7 From Engineer to Leader	What worked before may not work now; people follow the money; decide with enough information (pp. 107, 117, 135)	Incentives raise quantity more than quality (Jenkins et al., 1998); the fastest deciders considered several alternatives at once (Eisenhardt, 1989)	Give away the work that made you good; decide with enough information, not all of it
8 The Business Behind the Engineering	Business comes down to investment, cash and risk; beware customer concentration (pp. 89–92)	People keep funding failing projects they chose (Sleesman et al., 2012); business lines prove more stable than management teams (Kaplan et al., 2009)	Follow the cash, and diversify your own
9 Renewal	Be willing to change course; every job ends; look after the rest of your life (pp. 139–161)	Job loss harms well-being, and resources help (McKee-Ryan et al., 2005); social ties predict survival (Holt-Lunstad et al., 2010)	Savings, a current résumé, and friends you actually see

What Morse, Schell & Babcock add

Morse, Schell & Babcock put the responsibility where Zelnick does: "Each professional needs to take personal charge of their career, and to determine its direction rather than letting events take their own course" (Morse et al., 2020, p. 383).

2.2 Deliver and connect: starting well and being heard

Lectures 3 to 5 turned from what you want to how you are experienced by the people around you. Zelnick's instruction for a new job is to behave, from the first day, like the leader you hope to become: "Once you land the job you want, you should be regarded by others as leadership material and view yourself (and behave) as the leader you hope to become" (p. 47). In practice that meant three unglamorous habits — being early, answering the same day, and being seen (pp. 47–51) — and a manager kept free of surprises.

The research sharpened this. What predicts a good start is not hours but three conditions: knowing what your role is, believing you can do it, and being accepted by the people you work with (Bauer et al., 2007). Very long hours add little: among British munitions workers in the First World War, output at 70 hours a week was hardly higher than at 56 (Pencavel, 2015). Lecture 4 made the case that engineering which is not adopted has not yet succeeded. Adoption begins with listening — "The best negotiators listen first and make proposals only when absolutely pressed to do so" (pp. 49–50) — and ends with a written argument whose first sentence is the decision. A review of listening research found that being listened to builds trust (Kluger and Itzchakov, 2022); slides whose headline is a claim are understood better than slides whose headline is a topic (Garner and Alley, 2013).

Lecture 5 dealt with the people who make that harder. Zelnick distinguishes healthy politics — "negotiating and compromising" — from the kind most people mean when they use the word (pp. 72–73), and advises aiming to be trusted and respected rather than liked (p. 82). The evidence confirmed that perceived politics is a real strain on people (Chang et al., 2009), and that forgiveness is shaped more by the situation — an apology, a sense that harm was unintended — than by personality (Fehr et al., 2010). The tool Lecture 5 leaves you is the simplest: separate what happened from the story you are telling yourself about it, and argue about the first. In practice that means writing the facts of a difficult meeting down before writing what you think they mean, and taking only the first list to the person involved.

2.3 Hold the line: integrity, truth and mistakes

Lecture 6 is the one the roadmap draws differently from all the others. "Never compromise your integrity; it's all you have" (p. 52) is not, in Zelnick's hands, a value to be weighed against schedule and money; it is a limit on the set of things he will consider. His account of how honest people drift is specific: "you're likely to find numerous integrity 'shortcuts' that may appear to be reasonable and appropriate at the time" (p. 52).

What the research says: why the line has to be drawn in advance

- **Small steps make large ones easier.** Across four studies, people were more likely to commit a larger unethical act when smaller ones had come first (Welsh et al., 2015).
- **Silence is common, and it has reasons.** In interviews with 40 employees, 85%

described at least one occasion when they had not raised a concern with their managers, most often for fear of being seen negatively or damaging relationships (Milliken et al., 2003).

- **Owning a mistake works.** Apologies with more of the components of a full apology were judged more effective; acknowledging responsibility and offering to repair mattered most (Lewicki et al., 2016).
- **So does learning from one.** Training that treats errors as a source of learning outperformed training that tried to prevent them (Keith and Frese, 2008).

Zelnick's three steps for a mistake — take responsibility, correct it, learn from it (p. 61) — are the discipline that keeps a small error from becoming the "long string of small mistakes" he describes as the anatomy of a big one (p. 61). For an engineer, the practical form of all of this is the honest test report, and the habit of saying what the evidence does *not* cover.

2.4 Grow and adapt: leading, the business, and renewal

The last three lectures widened the frame. Lecture 7 took on the promotion that costs many engineers their footing: "the attributes that work well in one situation are often not those that lead to success in a subsequent situation" (p. 135). A new lead has to give away the work that made them good, keep their respect for people steady and their boundaries clear, and notice that "most human beings ... follow the money" (p. 107) — financial incentives raise the quantity of work more reliably than its quality (Jenkins et al., 1998). On deciding, Zelnick's 80/20 rule (p. 117) met the evidence that the fastest strategic decisions were made by teams that considered several alternatives at once, not by teams that skipped the analysis (Eisenhardt, 1989).

Lecture 8 made the business visible. "Business ultimately comes down to investment, cost of capital, revenues, costs and free cash flow — adjusted for risk and time. Period" (p. 89), and good companies fail by "running out of cash" (p. 90). Customer concentration — revenue that depends on a handful of customers — is the risk an engineer can often see before the finance team says it aloud (p. 92). The evidence added a warning about ourselves: people who chose an investment tend to keep funding it after it has gone wrong (Sleesman et al., 2012). And it added a reason to look past the people to the business itself: among companies studied from business plan to public company, the core business lines proved more stable than the management teams (Kaplan et al., 2009).

Lecture 9 closed the book the way Zelnick closes his. "I've always been willing to change course" (p. 139); every job ends, and the only question is "when," not "whether" (p. 143); so save, keep a current résumé, and know people before you need them (pp. 145–146). And beyond work: show up for people, stay fit, be grateful, and, "perhaps this is the key to it all: be yourself" (p. 161).

The research supports his advice to save and to keep friends close. Job loss measurably harms well-being, and personal, social and financial resources soften it (McKee-Ryan et al., 2005). Across 148 studies, people with stronger social relationships had about 50% greater odds of survival over the periods studied (Holt-Lunstad et al., 2010).

What Morse, Schell & Babcock add

Morse, Schell & Babcock describe the same widening of the frame from the engineer's side. Engineers, they note, "traditionally have spent about the last two-thirds of their careers with some level of management responsibility" (Morse et al., 2020, p. 365); the "mentor" stage of a career means taking "increased responsibility for influencing, guiding, directing, and developing other people" (Morse et al., 2020, p. 367); and "as engineers make the transition to manager, they must improve their communication skills further if they are to be effective" (Morse et al., 2020, p. 369).

Myth check: "A good decision is one that turned out well"

It is natural to grade decisions by their results, and the habit is hard to shake. In a classic set of experiments, people rated the *same* decision — made with the same information — as better when they were told it had turned out well, and worse when they were told it had turned out badly (Baron and Hershey, 1988). That is outcome bias, and it matters for everything that follows. A career is a long run of decisions under uncertainty; some good ones will turn out badly and some poor ones will be rescued by luck. Judge a decision by what was known, what options were considered, and how the likely consequences were weighed at the time — then use the outcome as data for the next one.

Engineering translation

Nine lectures, one system. Read Table 2.1 from left to right and it is a list of advice. Read it from top to bottom and it is a specification for the control system of Figure 3.1: each lecture built one or more of its blocks, from the setpoint (Lecture 1) to the watchdog (Lecture 9). Table 3.1 gives the exact mapping, block by block. The next chapter puts the system back together.

Chapter 3

The Control System for Success, Revisited

The introduction presented the Engineer's Roadmap before any of the lectures had been given. Every block on it was a promise: that a later lecture would explain what the block is in a career, what goes wrong with it, and what to do about it. The promises have now been kept, so the chart can be read differently. It is no longer a map of a course. It is a description of a system you are already running — with or without a written setpoint, with or without a sensor, with or without an interlock — and the only question is whether you run it on purpose.

The chart is the same one, block for block (Figure 3.1, printed on a landscape page of its own after Table 3.1). What is new in this chapter is that table: for each block, the practice that keeps it working, how often to do it, and the lecture where the practice was argued.

3.1 Why the chart is worth understanding

It would be possible to take the practices in Table 3.1 as a checklist and ignore the diagram. The diagram earns its place because it shows four things a checklist cannot.

The blocks interact. A missing setpoint does not show up as a missing setpoint; it shows up as a controller that works hard on whatever arrived last. A sensor you do not read does not show up as a sensor problem; it shows up at the annual review as a surprise. Most career trouble presents in one block and originates in another, which is why Table 4.2 of the introduction ("Failure signatures") gave each block a failure signature.

Delay changes everything. The work you do this week shows up in your test results this week and in your standing months or years later. Control engineers know what dead time does to a loop tuned as though it were not there: aggressive correction makes it oscillate. A capstone team feels the same delay on a small scale: the design decision made in week three shows up in the grade in week twelve. People misjudge such delays too, and the evidence is specific.

What the research says: people misjudge delays, and systems pay for it

In a classic experiment built on the "beer distribution game", participants managed a simulated production and distribution chain in which orders took several weeks to arrive. Most produced large, costly oscillations in inventory. The analysis showed why: participants anchored on what they could see and did not adequately account for orders already in the pipeline — the supply line — that is, for the delay between their action and its effect (Sterman, 1989). The career version is familiar: nothing moves for three months, so you change everything; then the effects of the first change arrive on top of the second.

Every action has effects you did not choose. Merton (1936) argued, in one of the most cited papers in sociology, that purposeful action routinely has consequences its actors did not intend, for reasons that include ignorance, error, and what he called the "imperious immediacy of interest", which crowds out attention to later consequences. The roadmap is a way of tracing

those consequences deliberately: a decision acts on the plant (first order), the plant's response changes what other people do (second order), and those changes feed back, after dead time, into your standing and your setpoint (third order).

Some things are not trade-offs. The interlock sits in the forward path, not in the controller. That placement is the argument of Lecture 6 in one line: integrity is not a heavily weighted term that a large enough benefit could outweigh; it is a condition that stops the process.

3.2 What each block asks of you

Table 3.1: What each block of the roadmap asks of you: the practice, how often, and the lecture that argued for it

Block	The practice	How often	Lecture
Setpoint	Keep a written list of values and goals; goals dated and checkable by someone else	Written once, revised yearly	L1, L2
Comparator	Put the current state next to the list and name the gap in a sentence	Weekly	L1, L3
Controller	Choose what to do and what not to: the impact–difficulty grid, three things well, one decision made when more analysis would not change it	Weekly, and at each decision	L2, L7, L8
Plant	Do the work that the gap calls for, where the leverage is, not only where you are comfortable	Daily	L3, L4, L5, L7
Sensor (fast loop)	Read what can be measured this week: tests, numbers, the review with your manager, people telling you plainly	Weekly	L3, L4
Dead time	Expect it: standing and reputation to respond months or years after the work; do not over-correct when nothing moves at once	Allow for it at every review	L3, L4
Observer	Keep two or three people who will tell you what you cannot measure yourself, and ask them	Once a quarter	L4, L5
Setpoint governor	Review the list itself, on a date you chose in advance, not in the week of a crisis	Annually	L1, L9
Feedforward	Hold savings, a current résumé and a network before a disturbance arrives	Maintained continuously	L9
Disturbances	Name the two or three you can see coming, and what is already in place for each	Quarterly, with the observer talks	L8, L9
Interlock	Decide in advance what you will not do, and treat it as a stop, not a trade-off	Decided once; tested rarely	L6
Integrity test	Ask whether you would defend the decision in writing to someone it harmed	At each decision that touches it	L6
Watchdog	Watch health, relationships and money; when one trips, stop and repair before continuing	Monthly check	L9

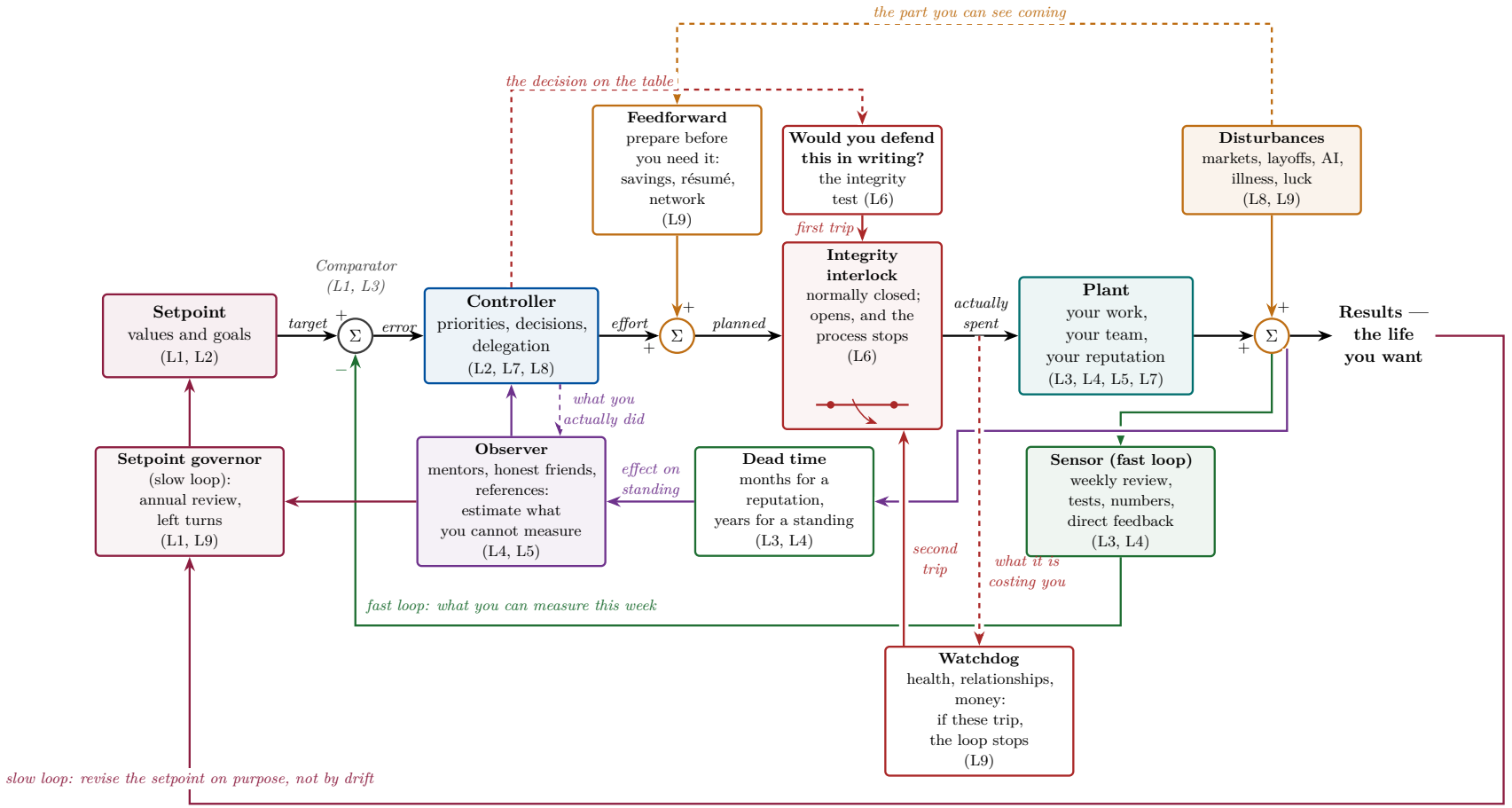


Figure 3.1: The Engineer's Roadmap. A career as a closed-loop system: a fast inner loop from the sensor straight to the comparator; a slow outer loop in which what you do reaches your standing only after dead time, is estimated by the observer, and revises the setpoint through the governor; feedforward against disturbances you can see coming; and an integrity interlock in series with everything that reaches the plant, feedforward included. **L1–L9** mark the lecture that develops each block. The interlock is not a weighting inside the controller: it sits in the forward path, normally closed, and either trip input opens it and stops the process. This is the same chart as the introduction's; what has changed is that every block now has a lecture, and a practice, behind it (Table 3.1).

3.3 A year of the loop

The practices in Table 3.1 run on different clocks. Figure 3.2 lays one year of them out, so that the routine is visible as a whole: a weekly review that closes the fast loop, a monthly check of the watchdog variables, quarterly conversations that feed the observer, and an annual review that is the only time the setpoint itself changes. The one element with no schedule is the interlock, which is tested whenever a decision touches it.

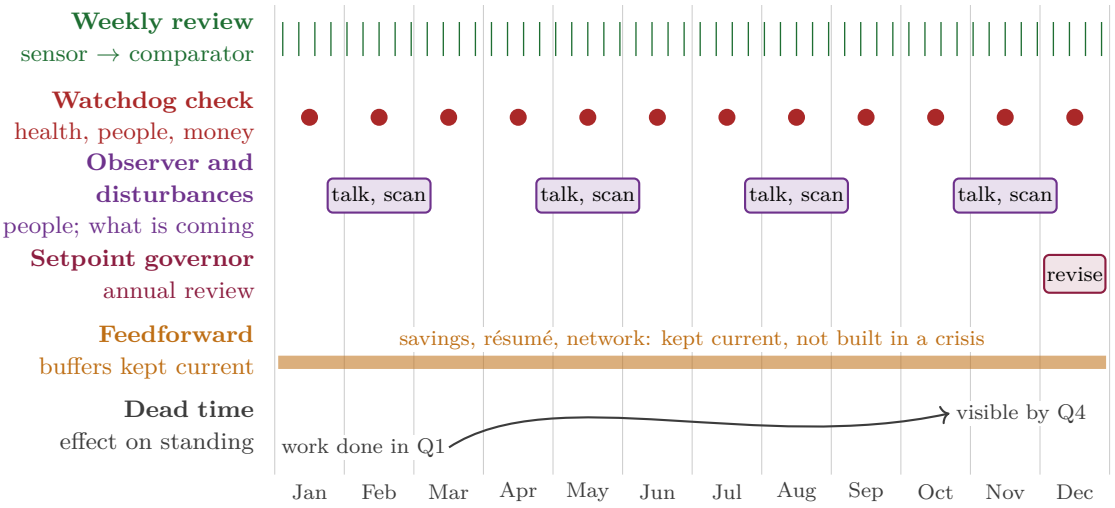


Figure 3.2: A year of the loop. Each row is a block of the roadmap run on its own clock. The weekly review closes the fast loop; the annual review is the only place the setpoint changes on purpose. The bottom row is the reason the others need patience: effort spent early in the year may not show up in your standing until late in it, or the next.

3.4 What you can do to get the most out of it

Most of the series' advice reduces to a small number of habits. None of them is dramatic; all of them compound. They follow the roadmap, from the setpoint to the watchdog. Where a habit has been tested, the evidence is cited; the others are the series' practices.

1. **Write the setpoint down, and date the goals.** It is the only block that nothing else can substitute for (Lecture 1). Monitoring progress toward written goals improves the odds of reaching them, especially when the progress is recorded (Harkin et al., 2016).

2. **Close the fast loop every week.** Twenty minutes, same time, same list: what moved, what did not, what I will do about it (Lectures 1 and 3).

3. **Agree what "good" means with the person who judges it.** At 90 days, and again each time the job changes (Lecture 3). Role clarity is one of the three best predictors of a good start (Bauer et al., 2007).

4. **Keep an observer.** Two or three people who will tell you how you are actually experienced, asked on purpose each quarter (Lectures 4 and 5).

5. **Put the decision first.** In every report, email and slide, so that good engineering is adopted rather than merely correct (Lecture 4). Slides headed by a claim are understood better than slides headed by a topic (Garner and Alley, 2013).

6. **Draw the line before the pressure arrives.** Write down, now, two things you will not do for a schedule or a bonus (Lecture 6). The slide from small lapses to large ones is gradual (Welsh et al., 2015); the line is easier to hold if it was drawn in advance.

7. **Keep the feedforward buffers current.** Savings, a résumé you could send tomorrow, a network you did not build in a panic (Lecture 9; Lecture 8 for your own finances).

8. **Guard the watchdog variables.** Health, the people you love, and money do not appear on a project plan, and they halt everything when they fail (Lecture 9).

Capstone move

This week, before your capstone's next milestone, run the fast loop once on purpose: take the Personal Setpoint you drafted in the introduction's "Before You Begin", put this week's reality next to its goals, and write one sentence per goal naming the gap. Then book the annual review — an actual date, twelve months from now — in your calendar.

Chapter 4

The Northline Case, Revisited

Teaching case

This case is fictional. Northline Energy Systems, its people, its customers and its numbers are invented for discussion, and all money in the case is in Canadian dollars. The version below retells the case from the introduction as a sequence of eight decisions, adds the few details needed to work them (each is marked *new in this retelling*), and changes none of the facts you already know. The exhibits are numbered C1 to C3 so that they are not confused with the introduction's Exhibits 1–5.

In the introduction, the Northline case was deliberately left unresolved: it named the kinds of complexity in an eight-year engineering career and promised that the lectures would supply the instruments. This chapter retells it with the instruments in hand. It is organised around decisions rather than years, because a career is experienced as a series of choices, each made with incomplete information and each changing the choices that come after it.

4.1 The setting

Northline Energy Systems, founded in Sudbury, Ontario, in 2014, builds containerised battery systems and the *Northstar* microgrid controller for remote communities and mine sites that run on diesel. It has 240 employees, 95 of them engineers, and $96 million in 2026 revenue, about 70% from hardware and 30% from service. Its largest programme, Northline 2, is 18 systems in three funded tranches: 12 for remote communities under a provincial decarbonisation programme and 6 for mining customers. The provincial sites — Site 6 among them (new in this retelling) — are fixed-price, paid on milestones, and carry liquidated damages of $18,000 a day past the completion date, capped at 10% of a site value of roughly $4.5 million: about 25 days, or $450,000, before the cap. The provincial programme is 62% of the Northline 2 backlog.

Amara Osei graduates in April 2027 in electrical engineering with a power and controls option. She grew up in Sudbury. Her card, written in fourth year, is her first setpoint (the introduction's Exhibit 3; Exhibit C3 reproduces it beside what is true six years later). The people around her are the ones you met in the introduction: Ito Ferreira, her manager, on site three weeks in four during commissioning season; Dale Whitcombe, the principal engineer who wrote the original fault logic; Gabriel Roy, the programme manager who owns the schedule; Rosalie Cardinal, operations manager for the community energy authority that hosts Sites 1 and 4; and Hanne Skov, the chief executive and co-founder.

4.2 Eight decisions

D1 — April 2027: which door. Three options, four weeks to choose. A protection and controls role at a provincial utility in Thunder Bay ($78,000, a defined-benefit pension, a four-year development programme with a named supervising P.Eng.); a controls role on Northline 2 in

Sudbury ($84,000 plus options over 0.04% of the company vesting over four years, and three to eight weeks a year on remote sites); or a funded MASc in power electronics ($27,000 a year for two years). As in the introduction, the case follows the Northline path from here; the instructor notes suggest how to work the others.

D2 — June 2027: what to ask for. Amara starts in early May (new in this retelling). Six weeks in, she has a laptop, a repository with no README, and a two-line instruction to "get familiar and start on the alarm rationalisation". Ito is on site. Nobody has said what good looks like at 90 days; her first formal review is eleven months away.

D3 — 2028: what to do about the fault logic. She has traced 14 trips across three sites to the battery fault logic's latching on a single cell-voltage excursion, and she assesses them as nuisance trips, each costing a site visit. In the design review Dale objects that the logic has run safely for fourteen years, that her test set is small, and that "we are not re-litigating the interlock six weeks before a shipment" (here "interlock" is the battery's protective fault logic, not the roadmap's integrity interlock). The change is not adopted. Two colleagues tell her afterwards that they had agreed and had not said so.

D4 — October 2029: what to say about Site 4. The site lead's daily reports and the controller's test logs read differently (Exhibit C2 reproduces both for 17 October). Gabriel wants a date. Rosalie must decide whether to place a $140,000 diesel order before freeze-up. Amara has the logs and is not on the customer call.

D5 — late 2029: whether to ship Site 6. The cell supplier's thermal-runaway propagation report covers enclosure revision B; Northline now ships revision C, with a changed vent path and cable entry. The supplier says the difference is immaterial and will confirm in writing in a few weeks. Northline's own reduced test would take about forty hours and a spare rack that is not on site. Shipping on time protects a milestone payment and avoids the daily damages; holding admits a gap in the evidence to a customer who has begun to ask harder questions. New in this retelling: as the controls engineer who assembled the site's test record, Amara is asked to sign it for shipment.

D6 — 2030–31: what to give away. Appointed in 2030, Amara leads six controls engineers, two of them new graduates and one of them formerly Dale's protégé. Her own best work — the estimator and the alarm logic — has to pass to other people. She must hire two engineers, write reviews for the first time, and still deliver part of the programme herself.

D7 — 2031–32: what to cut. A mining customer defers two sites; the provincial programme's third tranche waits on a spending review; receivables stretch. The board discusses bridge financing on terms that would reprice the options Amara holds. Hanne asks the engineering leads what could be cut — scope, features, the service model, or people.

D8 — 2033: whether to turn left. A larger firm offers a senior controls role in Vancouver at a 28% raise and a title three years ahead of Northline's. Her older sister has taken a job overseas, so if Amara moved, nobody would be near their mother in Sudbury. Northline's programme faces renewal after a provincial election in which the decarbonisation programme is being debated by both parties. Amara has not taken more than four consecutive days off since 2029, has not run since 2031, and has a licence application she has not finished.

Exhibit C1 — The decision register

#	When	The decision	Whose it is	Amara controls
D1	Apr 2027	Which of three offers	Hers	All of it
D2	Jun 2027	Whether and how to ask for a definition of "good"	Hers; Ito answers	The request
D3	2028	What to do after the review	The design review's call; hers on what next	Her evidence, timing and allies
D4	Oct 2029	What to say about Site 4	Gabriel's date; Rosalie's order	What she says, and to whom
D5	Late 2029	Whether Site 6 ships on revision B evidence	Gabriel and Hanne; she is asked to sign the test record	Her signature, and what she writes
D6	2030–31	What to delegate, and to whom	Hers	Assignments, reviews, hiring
D7	2031–32	What to cut	Hanne's; leads advise	Her advice; her own finances
D8	2033	Whether to take the Vancouver role	Hers, with her family	All of it

Exhibit C2 — Site 4, 17 October 2029: two accounts of the same day (the introduction's Exhibit 5)

Daily site report (site lead to programme manager, 17:42, verbatim extract):

> *Grid-forming testing progressing. Inverter firmware behaving better today after supplier patch. Expect to close out remaining test items this week and be ready for witness test w/c 22 Oct. Electrical subcontractor short one person, covering internally. No change to commissioning date.*

Controller test log (automatic, same site, same day, extract):

```
11:04   GFM-07 islanded transfer    FAIL (freq. excursion 1.2 Hz; ride-through 180 ms)
13:22   GFM-07 islanded transfer    FAIL (freq. excursion 0.9 Hz)
15:51   GFM-07 islanded transfer    FAIL (freq. excursion 1.0 Hz)
16:30   GFM-11 black start          NOT RUN (prerequisite GFM-07 open)
16:31   open test items:  9 of 24   (unchanged since 08 Oct)
```

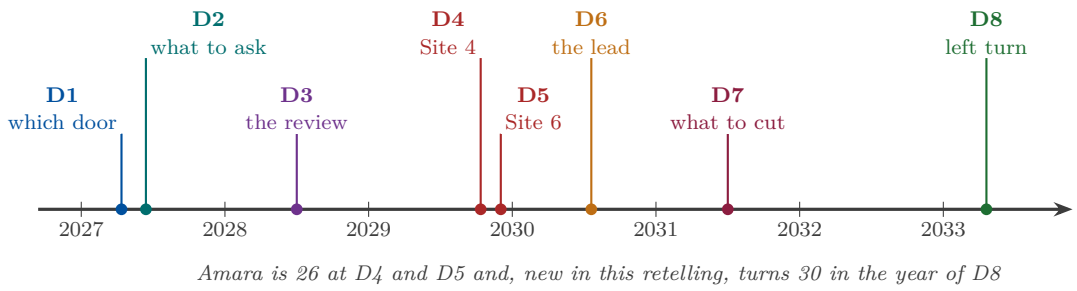


Figure 4.1: The Northline case as eight decisions, 2027–2033. Stems alternate in height only for legibility. D4 and D5 fall weeks apart in late 2029. D6 (2030–31) and D7 (2031–32) each stretch over more than a year; their dots mark where they begin.

Exhibit C3 — Amara's card in 2027, reread in 2033, the year she turns 30

Written in fourth year	What the case says is true in 2033
What matters to me	
Work that measurably cuts emissions	Six years on a programme built to cut diesel burn in remote communities
Being near my family	In Sudbury; her mother's only nearby family if she stays
Learning something hard every year	From controls to leading a team; the case does not say what she learned in 2033
Being someone people trust with bad news	Depends on D4 and D5 — the case does not say what she did
Where I want to be by 30	
Leading a commissioning team	Leading the controls team since 2030; the card named a commissioning team
Licensed	Application started, not finished
Able to carry a mortgage on my own	Not stated; her options' value is in doubt after the financing talks
Running again	Not since 2031
Not living out of a suitcase	The 2027 offer meant three to eight weeks a year on site; since then, not stated
What I am afraid of	
Being three years into something I do not respect, and not noticing	Not stated — which is the point of the question

Exhibit C3 is the comparator of Figure 3.1 applied to a whole career: the setpoint on the left, the measured state on the right, and the error in between. Some of the right column is blank on purpose. What Amara did at D4 and D5 is not recorded, because those are the decisions you are asked to make; and several things the card cares about are exactly the kind of slow, unmeasured variable that the case, like a career, never reports unless someone asks.

Chapter 5

Working the Case

The introduction promised that the case would not be treated as a worked example with an answer key, and this chapter keeps that promise in a particular way. It does not tell you what Amara should do. It shows what the series lets you *see* at each decision — the blocks involved, the options that are easy to miss, and the consequences that run on past the obvious ones — and then it asks the questions that decide it. Different readers, with different setpoints, will reach different defensible answers. That is not a weakness of the method. It is the method working: the roadmap does not choose your values for you; it makes the consequences of your values visible.

5.1 A method for any decision

Every decision below is worked the same way, in six steps. They are the series' tools, put in the order in which they are useful.

1. **Name the blocks and the complexity.** Which part of the roadmap is this decision about, and which of the six kinds of complexity from the introduction — technical, commercial, organisational, professional, community, personal — are in play?

2. **Widen the option set.** Write down at least three options, including one nobody in the room has proposed. The first option to arrive is rarely the only one.

3. **Trace the effects forward.** For each option, the *first-order* effect is what happens directly and soon; the *second-order* effect is how other people and the system respond to it; the *third-order* effect is what that response does, after dead time, to your standing, your future options and your setpoint.

4. **Imagine it has already failed (a premortem).** Assume the option you prefer was chosen and went badly a year later, and write down why.

5. **Check the interlock.** Is any option one you would not defend in writing to someone it harmed? If an option fails that integrity test, it leaves the set; the rest is ordinary trade-off.

6. **Choose, and set the sensor.** Decide, write down what would tell you — and when — that you were wrong, and judge the decision later by what was known at the time, not only by how it turned out.

What the research says: why the method has these steps

- **More than one option.** In a study of 356 decisions made by senior managers in organisations in the United States and Canada, managers developed more than one option in fewer than 20% of decisions; when several options were developed, the success rate rose from 56% to 70% (Nutt, 1999).

- **Imagining failure.** People who imagined that an outcome had already happened generated more explanations for it than people who imagined it only might happen (Mitchell et al., 1989). The study counted explanations rather than judging their accuracy, so it is best read as a way of widening what you consider, not as a forecast.
- **Consequences nobody chose.** Purposeful action reliably produces consequences its actors did not intend (Merton, 1936); tracing effects to the second and third order is a deliberate attempt to see some of them in advance.
- **Judging by process.** People rate the same decision better when told it turned out well (Baron and Hershey, 1988); recording what you knew and why you chose is the defence.

Figure 5.1 draws step 3. The important feature is on the horizontal axis: each order of effect arrives later than the one before, and the later ones pass through the dead time of Figure 3.1. That is why they are so easy to ignore when a decision is made, and so hard to ignore when they arrive.

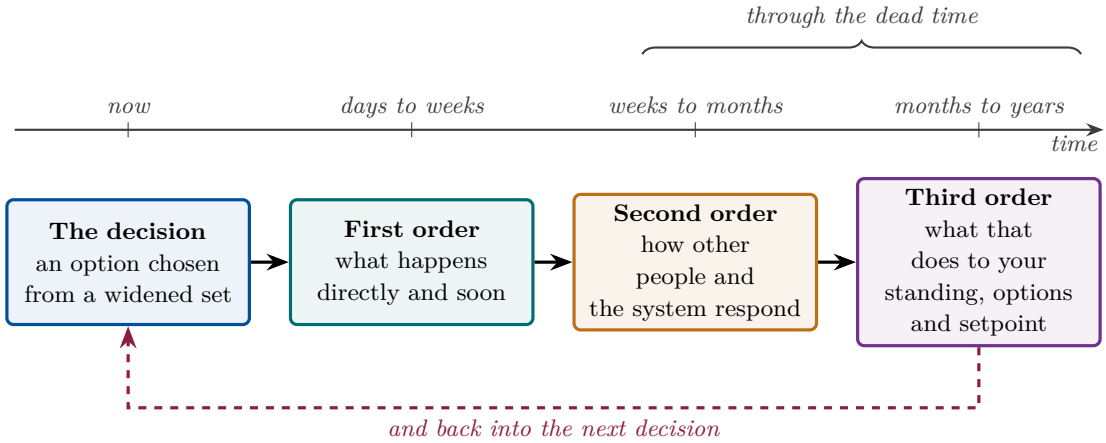


Figure 5.1: First-, second- and third-order effects. Each order arrives later than the last, and the later ones pass through the dead time of the roadmap — which is why they are underweighted when the decision is made. The dashed return is the point of the whole exercise: third-order effects become the conditions of the next decision.

The sections that follow apply the method to each decision in turn. Each decision's effects are set out in a table. In every table the options are listed in no particular order, each is given at least one gain and one cost, and none is marked as the answer.

5.2 D1 — Which door (April 2027)

What the series brings. This is a setpoint decision before it is anything else (Lecture 1): the three offers cannot be ranked until Amara's card is used to rank them. Zelnick's sweet spot — talent, passion and a specific opportunity, then checked against your values (pp. 29–33) — is the test. Fit between a person and a job measurably predicts satisfaction and intention to stay (Kristof-Brown et al., 2005). Lecture 2 adds the time-box: an ambitious option is easier to take if you decide in advance how long you will give it. Lecture 8 adds a question most graduates do not ask: how good is the underlying business, and how concentrated is it?

Table 5.1: D1 — the three offers, and a fourth option nobody proposed, traced to the third order

Option	First order	Second order	Third order
A. The utility	$78,000 and a pension; a named supervising P.Eng.; a move to Thunder Bay, about 1,000 km from Sudbury by road	Structured rotations and steady experience toward a licence; a slower pace and a narrower view of the commercial side	A clear route to "licensed by 30"; further from family; the card's "emissions" item depends on what the utility builds
B. Northline	$84,000 and options over 0.04%; home in Sudbury; weeks on remote sites	Exposure to all six kinds of complexity at once; her standing rises or falls with one programme that is 62% of the Northline 2 backlog	Fast growth if the programme holds; the options are worth something only if the company is sold or listed; the licence path depends on a licensed engineer who can verify her experience
C. The MASc	$27,000 a year for two years; depth in power electronics	A supervisor with industrial partners, who often hire; two years' later start in industry	A stronger technical profile in 2029; the "learning" item well served; licensing somewhat later, though in Ontario part of a master's can count toward the experience requirement
D. B, with conditions	Ask Northline, before accepting, for a named engineer to verify her experience and an agreed first 90 days	The answer tells her how the company treats a new graduate; a small risk of seeming demanding	Some of B's third-order risks reduced; costs a few days and some nerve

The questions that decide it.

- Score each option against each line of the card. Which line does each option serve, and which does it only postpone?
- Which option is easiest to reverse in two years, and what would reversing it cost?
- What would have to be true about Northline's backlog for Option B to be less risky than it looks — and could Amara find that out before she signs?
- Imagine it is 2029 and the choice has gone badly. Write the reason, for each option.

5.3 D2 — What to ask for (June 2027)

What the series brings. Lecture 3's argument is that a good start depends less on hours than on role clarity, confidence and acceptance (Bauer et al., 2007), and that a newcomer's own information-seeking helps. In roadmap terms, Amara has a plant and no sensor: unless something changes, nothing will tell her how she is doing for eleven months.

The questions that decide it. What does each option cost Ito, and what does it tell Amara? What does each teach Ito about how Amara will behave when something is actually wrong? Is there a reason to do more than one, or a reason not to?

Table 5.2: D2 — what to ask for, traced to the third order

Option	First order	Second order	Third order
Wait for the formal review	No demand on a stretched manager; time to learn the code first	Eleven months of work toward a target nobody has stated	A first review that may surprise either of them; a reputation for self-reliance
Message Ito: what does good look like at 90 days?	A few minutes of Ito's time	A stated target — possibly a narrow one, written in two lines	A manager who expects to hear from her; the target may shape more of her year than she intends
Draft her own 90-day plan and ask Ito to correct it	An hour of her time; a proposal to react to	Ito corrects a draft rather than inventing one; she may aim at the wrong things for a week	She begins to set her own targets; if the draft misreads the job, that is visible early
Ask Dale and her peers what good looks like here	A few conversations	Allies and an observer; their view of "good" may differ from Ito's	A reputation for listening before proposing — which bears directly on D3

5.4 D3 — What to do about the fault logic (2028)

What the series brings. Lecture 4: engineering that is not adopted has not yet succeeded, and adoption begins with listening to what the decision-maker fears. Lecture 5: keep technical conflict technical, and separate what happened in the review from the story about it. Lecture 2: know the difference between persisting and escalating. Lecture 6: the two colleagues who agreed privately are an example of the silence the research describes (Milliken et al., 2003). Dale's objection is also worth taking at face value: protective logic that has run safely for years is not something a careful engineer changes lightly, and a small test set is a real limitation.

The questions that decide it. What would Dale need to see to change his view, and is that reasonable? What does the colleagues' silence tell Amara as an observer — about the proposal, and about how reviews work at Northline? Which option would she be comfortable seeing on her record when she leads a team that includes Dale's former protégé?

Table 5.3: D3 — options after the design review, traced to the third order

Option	First order	Second order	Third order
Let it go	No further conflict; the trips continue	Site visits keep costing money; the review's decision stands, and may be right	Time for other work; she may learn that proposals die in review, and so may others
Build a larger evidence set, re-propose after shipment	Weeks of work; no change for now	The small-sample objection is answered, or her assessment is shown to be wrong	A reputation for evidence over insistence; weeks not spent on assigned work
Listen first: meet Dale, then propose a staged trial on one site	An hour with Dale; a narrower proposal; the trips continue meanwhile	Dale's concern about changing a protection function under schedule pressure is addressed, or confirmed	A working relationship with the person who reviews her designs; she may be read as having backed down
Take it to Ito or Hanne	A faster, documented decision, possibly	The cost of nuisance trips gets a decision owner; Dale may see his review bypassed	A reputation for raising costs to the right level, or for going around colleagues — which shapes her team in 2030
Ask the two colleagues to say so on the record	Two more voices	Evidence that the concern is shared; the review may start to feel like a vote	The colleagues are heard, or exposed; the question may become about people rather than evidence

5.5 D4 — What to say about Site 4 (October 2029)

What the series brings. This decision sits in three lectures at once. Lecture 6: default to the truth in what you report, and remember that silence has reasons that feel good at the time (Milliken et al., 2003). Lecture 5: a site lead under pressure is not necessarily acting in bad faith; two documents can both be sincere and still point in different directions. Lecture 4 asks who most needs the information — Gabriel, with a date to set; Rosalie, with a $140,000 order to place; the site lead, with a team to run — and how far each is from it (Exhibit C2). And Amara's card says she wants to be "someone people trust with bad news": what would that line ask of her here, and what would it cost?

The questions that decide it. Whose decision does the information actually affect, and does it reach them? Which option would Amara be comfortable defending to Rosalie if the diesel order turns out to have been placed, or not placed, on the wrong information? What would each option cost her, and the people deciding, if the logs turn out to matter — and if they turn out not to?

Table 5.4: D4 — what to say about Site 4, and to whom, traced to the third order

Option	First order	Second order	Third order
Say nothing; not her call	No friction; the site lead's and Gabriel's roles respected	Gabriel's date and Rosalie's order rest on the daily reports alone	If the logs were right, they were available and unread; if the reports were right, nothing lost
Talk to the site lead first	An awkward conversation with a colleague	The reports may change, or the disagreement becomes explicit; time passes before Rosalie's deadline	Trust with the site team; or a colleague who feels second-guessed
Send Gabriel the logs, without commentary	Gabriel sees both documents	The date is re-estimated on test evidence; the site lead may read it as going around him	Known as someone who puts evidence where decisions are made; a harder relationship on site
Ask Ito to raise it	Uses her manager's standing	Slower; Ito may be on site; Ito can weigh what she cannot see	Less exposure for her; less direct experience of the conversation
Ask to join the customer call	A junior engineer in a customer conversation	Rosalie hears the test status directly; Gabriel may object to an unplanned voice	Rosalie's trust in Northline; Amara's standing with programme management, either way

5.6 D5 — Whether to ship Site 6 (late 2029)

What the series brings. Lecture 6 is the centre of this decision, and the roadmap's interlock is the reason it is drawn separately. Zelnick's warning is specific: shortcuts "may appear to be reasonable and appropriate at the time" (p. 52). Morse, Schell & Babcock tell new engineers that "you must begin building for yourself a personal reputation on which your future career success will depend" (Morse et al., 2020, p. 362). Lecture 4 governs how any position is written: the decision first, then the evidence and its limits. Lecture 8 prices the alternatives: $18,000 a day, capped at about $450,000, and a milestone payment that matters to a company whose provincial programme is 62% of the Northline 2 backlog. And the technical question is real: whether a changed vent path and cable entry are material to thermal-runaway propagation is an engineering judgement, not a formality.

The interlock step. The method asks one question before the trade-offs begin: is any option in the set one Amara would not defend in writing to someone it harmed? The framework deliberately does not answer it for her. Whether the revision gap engages the interlock depends on an engineering fact — is the change material to the failure mode the test addresses? — and on what each option tells the customer. If some option fails the test, it leaves the set, and the remaining choice is ordinary engineering and commercial judgement. If none does, all of them are trade-offs, priced as Lecture 8 would price them. Either way, the reasoning is recorded before the outcome is known.

The questions that decide it.

- What is the smallest piece of evidence that would settle whether the change is material, and how quickly could it be obtained?
- Which options survive the interlock step for you, and why?

Table 5.5: D5 — options for Site 6, traced to the third order

Option	First order	Second order	Third order
Ship on time, relying on the supplier's assurance; note the revision gap internally	Milestone paid; no damages	The customer is not told of the gap; the supplier's written confirmation follows, or does not	If the change is immaterial, no delay was needed; if it is material, a shipment the test record did not cover; either way, the internal note is part of the record
Ship on time; disclose the gap to the customer in writing, with the supplier's dated commitment	Milestone likely paid; an uncomfortable letter	The customer may accept, object, or delay acceptance; other customers may ask the same question	Trust tested in the open; a precedent for disclosure on later sites
Hold for the forty-hour test	Damages accrue toward the cap; a rack must be found	Schedule pressure moves to later sites; the evidence gap is closed	A test record that covers what ships; a cost and a delay she will be associated with
Get interim evidence first: the supplier's engineering analysis of the change, in days rather than weeks	A short delay, possibly none	The decision rests on analysis rather than assurance; the analysis may be inconclusive	A faster route to the same choice, or a new question to answer
Put her position in writing to the accountable decision-maker, and sign for the tests she ran on the revision tested	Her position recorded; the decision still rests with others	Gabriel and Hanne decide with her view in hand; some may read it as covering herself	How her future sign-offs are treated: as information to use, or as an obstacle

- Who is harmed, and how, if each option goes wrong? Who bears the cost if each option goes right but was expensive?
- What will Amara's signature on a test record mean to the next customer, and to the next engineer who signs after her?

5.7 D6 — What to give away (2030–31)

What the series brings. Lecture 7 is built for this moment. Zelnick observes that "the attributes that work well in one situation are often not those that lead to success in a subsequent situation" (p. 135). Lecture 7 argued that most new leads have to give some of their own work away, and Morse, Schell & Babcock describe the next career stage as taking "increased responsibility for influencing, guiding, directing, and developing other people" (Morse et al., 2020, p. 367). Whether, what, to whom and at what cost are Amara's questions. Two further lessons apply directly. Incentives shape behaviour, and financial ones raise the quantity of work more reliably than its quality (Jenkins et al., 1998), so what Amara praises and rewards will be read closely. And she will have to decide faster than she is used to — which, as Section 2.4 noted, need not mean considering fewer alternatives (Eisenhardt, 1989).

Table 5.6: D6 — what to give away, and to whom, traced to the third order

Option	First order	Second order	Third order
Keep the estimator herself for one more release	Quality held where she can see it while new hires ramp up	Less time to lead; the team may read the estimator as hers, not theirs	A lead who is hard to spare from her own code — which narrows later options, including D8
Hand the estimator to Dale's former protégé	Three months of slower, different work; a possible missed milestone	A working relationship built on trust rather than history; if it fails, it fails in public	A team less likely to divide along the lines of the 2028 review — or a harder one if the handover goes badly
Pair the two new graduates on the alarm logic under a senior engineer	Her time spent teaching; the senior engineer's time too	Capacity she did not have before; early errors, which need a review before they reach a site	A team that can survive her absence — which Lecture 9 argues every job eventually requires
Hire first, delegate after	Nothing given away yet; two searches to run	The current team carries the load longer; new hires arrive to a clear division of work	Delegation shaped around people she chose; the existing team may notice who was trusted first

The questions that decide it. Which piece of her own work is she least willing to give away, and why? What would she need to see in six months to know that the handover was right? What does each choice teach the team about how she will judge them?

5.8 D7 — What to cut (2031–32)

What the series brings. Lecture 8 supplies the vocabulary: follow the cash, not the profit; beware concentration; and notice escalation — the tendency to keep funding what we chose after it has gone wrong (Sleesman et al., 2012). Northline's position illustrates Zelnick's warning: a business that may be sound can still be in difficulty because the cash arrives later than the costs (p. 90). Lecture 8 also turns the lens on the individual: Amara's salary and her options now depend on the same company, and on the same programme.

The questions that decide it. Which cut saves cash soonest, and which costs cash later? Where does the engineering ranking of the options differ from the cash ranking, and whose job is it to say so? And the personal question Lecture 8 would ask: how much of Amara's own future — salary, options, savings — depends on this one company, and would she change anything about that now?

Table 5.7: D7 — what could be cut, and one option nobody proposed, traced to the third order

Cut	First order	Second order	Third order
Scope	Fewer deliverables on deferred sites	Contract terms and customer expectations must be renegotiated	A smaller programme that is still trusted, or a reputation for retreating
Features	Less engineering spend now	A product that competes on fewer grounds; a simpler system to support	Harder renewals and tranche 3 negotiations; a narrower product that may be more reliable
Service model	Lower operating cost	Service — 30% of revenue in 2026, and recurring — is put at risk	Customers in remote communities with less support; a business less able to weather the next gap
People	Immediate cash saving	Lost capacity and knowledge; the remaining team watches how it is done	A company more likely to survive the gap; its ability to hire later, and how Amara is remembered as a lead
Cut nothing yet: seek bridge financing or defer spending	Cash from outside; no capability lost	Terms that reprice the options, or dilution if the bridge converts	Time bought; the underlying gap may remain

5.9 D8 — Whether to turn left (2033)

What the series brings. Every lecture reaches this decision. Lecture 1: it is a setpoint decision, and Exhibit C3 is the comparator. Lecture 9: "I've always been willing to change course" (p. 139); Lecture 9 also argued that a large change can often be tested in smaller steps first — whether this one can is part of the question. Lecture 8: the programme's renewal after an election is a disturbance she can see coming. Lecture 2: looking back over long periods, people report regretting what they did not do more than what they did (Gilovich and Medvec, 1995); the finding concerns how regret is remembered, not which choices turn out well, so it cuts in no particular direction here. And the watchdog of the roadmap has readings to check: no break longer than four days since 2029, no running since 2031, and her own social ties, which a move would disrupt and a stay would not by itself protect — people with stronger social relationships had greater odds of survival (Holt-Lunstad et al., 2010). Is the watchdog signalling, and if so, which option does that bear on?

The questions that decide it.

- Read Exhibit C3 line by line. Which items does each option move toward the setpoint, and which away from it? Should the setpoint itself change, and is this the right week to decide that?
- Which of the pressures in 2033 is a change in what Amara wants, and which is a disturbance she could plan for?
- What is the cheapest experiment, if any, that would tell her the difference before she commits?
- Imagine it is 2036 and she regrets the choice. Write the reason, for each option.

Table 5.8: D8 — the left turn, traced to the third order

Option	First order	Second order	Third order
Take the Vancouver role	A 28% raise and a senior title; a move across the country	A new team, city and network; new learning; a new licensing jurisdiction to check; her mother has no family nearby	A faster career curve, less tied to one programme; a family arrangement that must be solved some other way
Stay, and renegotiate at Northline	A conversation with Hanne, using the offer as evidence	Northline responds, or shows what it cannot do before the election; continuity with the team she built	Near family; her career still concentrated in one programme facing renewal
Test first: visit, meet the team, ask about a later start	Weeks of delay; a signal of interest	Better information on the job, the city and the care arrangements; the offer may not wait	The decision rests on more than the offer letter — or the choice is made for her
Look for a role that serves both	A search in Ontario, or remote work	Slower; may not match the title or the pay	Keeps the family line of the card; tests how much the title matters
Pause: take a real break and send the licence application	Two weeks away; an application sent	The offer may lapse; the licence work competes with her job; clearer thinking	Any choice made from a steadier base; one card item moved forward

5.10 How the decisions feed each other

Worked one at a time, the eight decisions look separate. Figure 5.2 shows why they are not. The third-order effects of each become part of the conditions of later ones: how D2 goes shapes the standing Amara brings to D3; how D3 is remembered shapes the team she leads at D6; what she does at D4 and D5 becomes part of her reputation — and a reputation is what another firm is hiring when it makes an offer like the one at D8; the business pressures of D7, and the hours they demand, are part of why the watchdog may be signalling at D8; and the choice of Sudbury at D1 is the family line that D8 reopens. None of these links is certain. All of them are plausible, and none of them would be visible if each decision were judged only by its first-order effect.

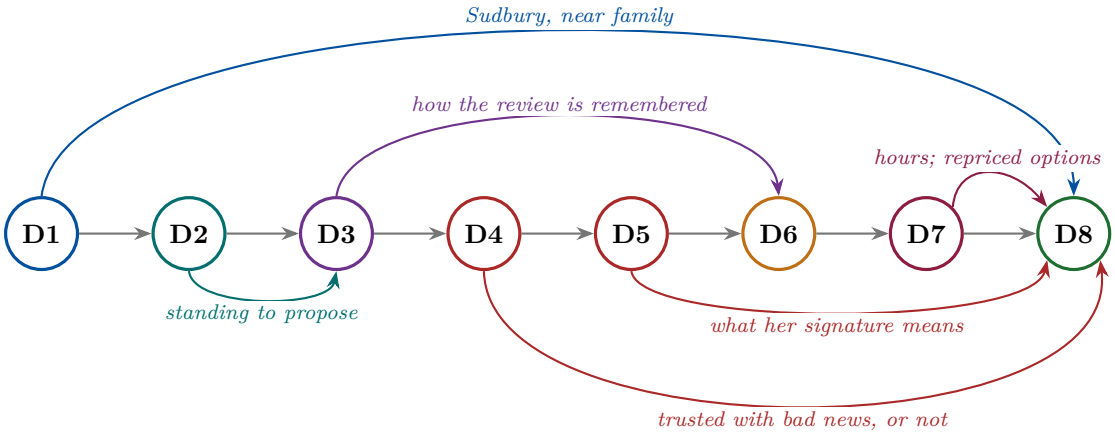


Figure 5.2: How the decisions feed each other. The grey chain is chronology; the coloured arcs are some of the ways a decision's later effects become the conditions of another. They are plausible links, not certainties — which is exactly why they need to be traced on purpose.

Discussion questions

1. Pick one decision from D1–D8 and choose an option. Write its first-, second- and third-order effects in your own words, and name the lecture behind each.
2. At which decision does your answer depend most on the setpoint — that is, where would two people with different cards both be right to choose differently?
3. Choose one arc in Figure 5.2 and argue that it is weaker than it looks. Then add an arc the figure missed.
4. For D5, say which options survive the interlock step for you, and what engineering fact would change your answer.

Chapter 6

Open Questions

The case is finished; the questions are not. Chapter 5 worked each decision on its own terms. This chapter asks the questions that cut across them, and then turns them on you. None of them has an answer key. Each has better and worse answers, and the difference lies in the reasoning rather than in the option chosen — above all, in how far forward it looks.

6.1 Questions about the case

1. **The earliest decision.** D1 was made in the spring of graduation, with four weeks to think. Trace one option forward to 2033: what did it make possible at D8, and what did it rule out? Would you still choose it knowing only what Amara knew in April 2027?

2. **The cheapest decision.** Asking at D2 would cost a few minutes. Name the first-, second- and third-order effects of asking and of not asking, and say which decision later in the case each most affects.

3. **The decision that was not hers.** At D4 and D5 the formal authority sat with other people. What did Amara actually control, and what are the second-order effects on the company of an engineer who treats "not my call" as the end of the question — and of one who does not?

4. **The interlock.** For D5, write the strongest case for each option that survives your interlock step. Then write what would have to be true for you to be wrong.

5. **The business.** At D7, which cut looks cheapest in the first year and most expensive in the third? Who in the room is best placed to say so, and what would it cost them?

6. **Other people's third order.** Choose one decision and trace its effects to the third order for someone other than Amara — Rosalie's community, Dale's former protégé, the engineer who signs the next test record. Does that change which option you prefer?

7. **The setpoint.** At D8, is Amara choosing between options, or choosing what she wants? If the answer is the second, what would you do first, and why?

6.2 Questions about you

1. Which block of the roadmap is weakest in your own life at the moment, and what is its failure signature? What would you change this month?

2. Name a decision in the next year where the first-order effect is attractive and the third-order effect worries you. What makes the third order easy to set aside?

3. What are two things you will not do, whatever the schedule or the reward? Write them down now, before anything tests them.

4. Who are your observers? If you cannot name two people who would tell you plainly how you are doing, what would it take to find them?

5. Which of the watchdog variables — health, the people you love, money — is closest to tripping, and what would you give up to reset it?

6. Six years from now you will reread your Personal Setpoint, as Amara reread her card. Which line do you expect to have changed, and which do you hope has not?

Assignment — A decision of your own (final assignment of the series)

Task.

1. **Revise your setpoint.** Take the Personal Setpoint you drafted before Lecture 1 and revise it in light of the series. Mark what changed and say, in one sentence each, why.
2. **Choose a decision.** Pick one real decision you expect to make in the next twelve months — a job, a project, a move, a commitment. It does not have to be large.
3. **Work it.** Apply the six steps of Section 5.1: name the blocks and the complexity; list at least three options, one of which nobody has suggested to you; build a table of first-, second- and third-order effects (at least three options by three orders); write a short premortem for the option you prefer (only that option); state the interlock check and its result.
4. **Set the sensor.** Say what evidence would tell you, and by what date, that you chose wrongly, and what you would do then.

Deliverable and due date. Three pages at most (PDF); the required effects table may go on one extra appendix page, not counted in the three. Due two weeks after this session. You choose the decision and what to disclose; a real decision described in general terms earns full marks.

Marking (10 marks).

- *Revised setpoint* (2): changes marked and each explained (2); revised without explanation (1); unchanged or missing (0).
- *Option set* (2): three or more genuinely different options, including one not proposed by anyone else (2); two options, or three variants of one (1); one (0).
- *Effects* (3): first-, second- and third-order effects for every option, with the third order linked to setpoint, standing or future options (3); two orders only (2); first order only (1); missing (0).
- *Premortem and interlock* (1.5): a specific failure story and a stated interlock check (1.5); one of the two (0.75); neither (0).
- *Sensor* (1.5): a named indicator, a date and a planned response (1.5); an indicator only (0.75); missing (0).

6.3 A last word

The series began with a book, and it is fitting to end with it. Zelnick's *Success* is worth nine lectures not because every line passed through the evidence unchanged — some were sharpened by it, as when the long game turned out to need kill criteria as well as perseverance, and ambition an honest estimate of how long things take — but because its advice comes from someone who has run large organisations in film, music and games and built his own investment firm, who has made time for years for people starting their careers, and who shows the working. Its last pages are not about deals. "At some point, though, you also need to want the life you have" (p. 159), he writes, and then: "perhaps this is the key to it all: be yourself" (p. 161).

In the language of this series, that is a statement about the setpoint. The loop can be tuned, the sensors improved, the interlock drawn and the watchdog guarded, but the system only works if the reference it tracks is genuinely yours. Write it down. Read it every week. Change it on purpose. And when you face a decision that matters, ask what happens next, and after that, and after that.

> **The one-sentence version of this document.** Write the setpoint down and read it, close the fast loop every week and the slow one every year, draw the interlock before anything tests it, and before any decision that matters, widen the options and ask "and then what?" three times.

Glossary

Bridge financing Short-term funding, often a loan, that carries a company to an expected later event such as a payment or a funding round.

Comparator The element that subtracts what you have measured from what you said you wanted; its output is the error.

Controller What you do with the gap between where you are and where you said you wanted to be: priorities, decisions, delegation.

Customer concentration Revenue that depends on a small number of customers or programmes.

Dead time The delay between an action and its visible effect; in a career, the months or years before work changes a reputation or a standing.

Decision register A dated list of the decisions in a project or a career, recording who owns each one and what the person deciding controls.

Disturbance An input you do not control that moves the output: a market, a layoff, a spending review, luck.

Escalation of commitment Continuing to invest in a failing course of action because you chose it.

Fast loop The inner feedback loop from the sensor straight to the comparator: what you can measure this week.

Feedforward Acting on a predicted disturbance before the error appears: savings, a current résumé, a network.

First-order effect The direct and immediate result of a decision.

Integrity test The question that can open the interlock: would you defend this decision, in writing, to someone it harmed?

Interlock A condition that stops a process rather than trading off against other objectives; here, integrity.

Kill criteria Conditions, written in advance, under which you will stop pursuing a goal; a stopping rule.

Liquidated damages A contractually fixed amount payable for each day of delay, agreed in advance instead of proving actual loss.

Normally closed A contact that conducts until something opens it; the roadmap's interlock is drawn this way, so the process runs until a trip stops it.

Nuisance trip A protective shutdown triggered when no real fault is present.

Observer An estimate of states you cannot measure directly, built from what you did and what you can see; here, the people who tell you the truth about your standing.

Option set The alternatives actually considered for a decision; widening it is the second step of the method.

Outcome bias Judging the quality of a decision by how it turned out rather than by what was known when it was made.

Personal Setpoint The written list of values and goals each student drafted before Lecture 1 and revises in the final assignment.

Plant The part of the world your effort acts on: your work, your team, your reputation.

Premortem Imagining that a chosen option has already failed and writing down why, to widen what you consider before committing.

Second-order effect How other people and the system respond to the first-order effect of a decision.

Sensor Short-cycle measurement of what can be measured directly: tests, numbers, a weekly review, people telling you plainly.

Setpoint The reference the loop is driven towards; here, the written list of values and goals.

Setpoint governor The slow outer loop that revises the setpoint itself, deliberately rather than by drift.

Slow loop The outer loop through dead time, the observer and the setpoint governor: how your standing changes, and what you revise in response.

Third-order effect What the response to a decision does, usually after a delay, to your standing, your future options and your setpoint.

Tranche One funded instalment of a larger programme; Northline 2 has three.

Unintended consequence An effect of purposeful action that its actors did not intend.

Watchdog A monitor that halts the system when something essential fails; here, health, relationships and money.

Instructor Notes

Purpose and timing

This document is the closing session of the series. It works best as a 75-minute session, or as a 50-minute session with Chapter 2 set as reading beforehand. Materials: printed copies of Exhibits C1 to C3, Figure 3.1 and Figure 5.2, one page each.

Session plan

The plan below is one way to spend 75 minutes.

A 75-minute session plan for the conclusion

Minutes	Segment	Instructor moves
0–10	The series in one page	Put Table 2.1 on the screen. Ask each group to name the one instruction they have already started using, and the one they doubt.
10–20	The roadmap as a routine	Walk Figure 3.2. Ask students to write the date of their own annual review before they leave.
20–55	The case, in eight groups	Assign one decision (D1–D8) to each group. Each group spends about 20 minutes building the effects table for its decision, then presents one surprising third-order effect in 60 seconds.
55–70	How the decisions connect	Draw Figure 5.2 live from the groups' third-order effects (5 minutes), then run the Discussion questions of Chapter 5 (10 minutes).
70–75	Close	Set the final assignment. Read the last paragraph of Chapter 6.

Running the case

The most productive format is a jigsaw: each group owns one decision and becomes the room's expert on it. Two practical points. First, keep the groups from arguing about what Amara "should" do before they have built the table; the table is where most of the learning happens. Second, give D5 to a group comfortable with ambiguity, and ask it to present the interlock step separately from the trade-offs — the distinction between a stop and a weighting is the single idea most worth carrying out of the series. Two quick checks keep the case honest: the damages cap is 10% of about $4.5 million, or $450,000, reached after 25 days at $18,000; and D2 falls about six weeks after Amara starts, in June 2027. If you ran the utility or MASc streams suggested in the introduction's notes, those tables can work D1 from their own option and D8 as the offer they might face on that path. For the utility stream, D3, D5 and D6 carry over with little change; for the MASc stream, a thesis-scope dispute with a supervisor stands in for D3, and a data-integrity question before a paper for D5.

Talking points for the Discussion questions

These notes are for you, not for the students. The student-facing chapters reach no verdict on the case; these are lines of argument worth drawing out if a room stalls.

Chapter 5

Q1: students usually find the second order easy and the third order hard; ask them to name one person whose view of Amara changes. Q2: D1 and D8 are the usual answers; push on D4, where the card's "trusted with bad news" line does real work. Q3: the weakest arc is often D1 to D8; ask what else keeps Amara in Sudbury. Q4: expect a split between students who treat the revision gap as an engineering question and those who treat it as an integrity question; ask each side what fact would move them.

Chapter 6

The case questions work well as exam prompts. The personal questions should stay personal: invite volunteers, and do not collect answers.

Marking guidance

The final assignment is marked on the method, not on the decision the student chooses or the option they prefer. The most common weakness is an option set of three variants of one idea; the second is a third-order column that repeats the second. Reward specificity: a named person who responds, a dated indicator, a premortem that tells a story rather than listing risks.

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